

**RESEARCH ADMINISTRATION SERVQUAL: A CASE STUDY ON SERVICE  
QUALITY AT THE UNIVERSITY OF PUERTO RICO MAYAGUEZ R&D  
CENTER**

by

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## **Abstract**

This thesis utilizes a case study methodology to analyze and evaluate service quality at a Research Administration Center. The case selected for the study was the University of Puerto Rico Mayagüez Campus' (UPRM) Research and Development (R&D) Center. The method of analysis required the development and use of a modified SERVQUAL instrument to gather quantitative and qualitative data about investigator expectations and perceptions of service quality for each R&D Center unit. The data was utilized to perform a gap analysis and an impact analysis, the results of which are summarized by individual unit. In all units, investigators prioritized *responsiveness* and *reliability* dimensions over all other aspects of service quality. A comparative section was prepared to identify trends and overall R&D Center behavior. The analysis of investigator perceptions reveal various positive aspects and presents areas with high potential for improvement.

## **Resumen**

Esta tesis utiliza como metodología el estudio de caso para analizar y evaluar la calidad de servicio en un Centro de Administración de Investigación. El escenario de estudio fue el Centro de Investigación y Desarrollo (CID) – de la Universidad de Puerto Rico, Recinto de Mayagüez (UPRM). El método de análisis implicó el uso del instrumento SERVQUAL modificado, para recopilar datos cuantitativos y cualitativos sobre las expectativas de los investigadores y la percepción de la calidad del servicio para cada unidad del CID. Estos datos se utilizaron para realizar un “gap” análisis de brecha y un análisis de impacto, cuyos resultados se resumen por unidad. En todas las unidades, los investigadores priorizaron las dimensiones “*responsabilidad*” y “*confiabilidad*” sobre todos los demás aspectos de calidad del servicio. Se preparó una sección comparativa para identificar las tendencias y el comportamiento de todo el CID. El análisis de estas percepciones revela varios aspectos positivos y presenta áreas con alto potencial de mejora.

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## **Dedication**

This achievement is dedicated to God for being the center of my life. To my husband, Adolfo G. Vargas, for his love and constant support. To our future lovely daughter Valentina, for becoming our motivation and inspiration to be better. To my mother, Yaneth García, for all her love, support and dedication to help us overcome life's obstacles and demonstrate that everything is possible. To my father, Santiago Torres, who is in heaven and played a fundamental role in helping me reach this stage. To my brothers, Luis Carlos Torres and Santiago Torres, for their love and protection.

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## Table of Contents

1	Introduction .....	1
2	Literature Review .....	6
2.1	Service Quality .....	6
2.2	Model to Evaluate Quality of a Service .....	8
2.3	Service Quality in a Research Administration center .....	11
3	Methodology.....	16
3.1	Data Collection.....	16
4	Demographic Characteristics.....	21
5	Gap Analysis.....	23
5.1	Proposal Development Unit Gap Analysis by Quality Dimension .....	24
5.2	Weighted Average Gap Score for the Proposal Development Unit.....	26
5.3	Proposal Development Unit Gap Analysis for Individual Items.....	27
5.4	Proposal Submission Unit Gap Analysis by Quality Dimension .....	32
5.5	Weighted Average Gap Score for the Proposal Submission Unit.....	34
5.6	Proposal Submission Unit Gap Analysis for Individual Items .....	35
5.7	Post-Award Division Gap Analysis by Quality Dimension.....	40
5.8	Weighted Average Gap Score for the Post-Award Division.....	42
5.9	Post-Award Division Gap Analysis for Individual Items .....	42
6	Service Quality Areas by Unit with Expected Impact of Improvement Initiatives .....	47
6.1	Proposal Development Unit .....	47
6.2	Proposal Submission Unit .....	49
6.3	Post-Award Division .....	51
7	Item Comparison by Dimension (All Service Units) .....	53
8	Qualitative Data.....	59
8.1	Pre-Award Researcher Comments .....	59
8.2	Pre-Award Improvements Suggested by Researchers .....	62
8.2.1	Proposal Development Unit.....	63
8.2.2	Proposal Submission Unit.....	63
8.3	Post-Award Researcher Comments.....	64
8.4	General Post-Award Improvements Suggested by Researchers .....	68

8.5	Improvements to Specific Post-Award Offices Suggested by Researchers .....	69
8.5.1	Accounting & Finance .....	70
8.5.2	Budget .....	72
8.5.3	Purchasing .....	72
8.6	R&D Center Researcher Comments .....	72
8.7	Office of the Director Researcher Comments .....	73
8.8	R&D Center Improvements Suggested by Researchers .....	73
9	Conclusions .....	75
9.1	Future avenues for research.....	79
9.2	Limitations .....	80
10	Recommendations.....	82
10.1	Pre-Award - Proposal Development Unit .....	82
10.2	Pre-Award - Proposal Submission Unit .....	83
10.3	Post-Award Division .....	85
10.4	R&D Center (Director's Office) .....	89
11	Bibliography .....	91
12	Appendixes .....	97



## List of Tables

Table 1: Quality Dimension for the Proposal Development Unit.....	25
Table 2: Weighted Gap Score for the Proposal Development Unit (n=29).....	26
Table 3: PDU - Item Expectation, Perception, Gap Score, and p-value by Dimension (n=29) ...	31
Table 4: Quality Dimension Scores for the Proposal Submission Unit (n=85).....	32
Table 5: Weighted Average Gap Score for the Proposal Submission Unit (n=85) .....	34
Table 6: PSU - Item Expectation, Perception, Gap Score, and p-value by Dimension (n=85) ....	39
Table 7: Quality Dimension Scores for the Post-Award Division (n=88).....	40
Table 8 Weighted Average Gap Score for the Post-Award Division (n=88) .....	42
Table 9: Post-Award -Item Expectation, Perception, Gap Score, and p-value by Dimension .....	46
Table 10: Impact Classification Criteria for Proposal Development Unit Initiatives.....	48
Table 11: Impact Classification Criteria for Proposal Submission Unit Initiatives.....	50
Table 12: Impact Classification Criteria for Post-Award Division Initiatives .....	52
Table 13: Responsiveness Dimension: Service Unit Comparison by Item .....	53
Table 14: Reliability Dimension: Service Unit Comparison by Item.....	54
Table 15: Assurance Dimension: Service Unit Comparison by Item .....	55
Table 16: Empathy Dimension: Service Unit Comparison by Item .....	56
Table 17: Tangibles Dimension: Service Unit Comparison by Item.....	57
Table 18: Most Frequent Words in the PDU corpus.....	60
Table 19: Most Frequent Words in the PSU corpus .....	61
Table 20: Most Frequent Words in the Post-Award Division corpus.....	65

## List of Figures

Figure 1: Average Score for the Proposal Development Unit .....	25
Figure 2: Quality Dimension Priority for the Proposal Development Unit. ....	26
Figure 3: Average Score for the Proposal Submission Unit .....	33
Figure 4: Quality Dimension Priority for the Proposal Submission Unit.....	34
Figure 5: Average Score for the Post-Award Division.....	41
Figure 6: Quality Dimension Priority for the Post-Award Division.....	42
Figure 7: Responsiveness Dimension: Service Unit Comparison by Item .....	53
Figure 8: Reliability dimension: service unit comparison by item .....	54
Figure 9: Assurance Dimension: Service Unit Comparison by Item.....	55
Figure 10: Empathy Dimension: Service Unit Comparison by Item.....	56
Figure 11: Tangibles Dimension: Service Unit Comparison by Item.....	57
Figure 12: PDU Corpus Word Link.....	60
Figure 13: Keyword Links: PDU.....	61
Figure 14: PSU Corpus Word Link .....	62
Figure 15: Keyword Links: PSU.....	62
Figure 16: Post-Award Corpus Word Link.....	66
Figure 17:Keyword Links: Post- Award.....	67
Figure 18: Keyword Links: Accounting .....	67
Figure 19: Keyword Links: Time .....	67
Figure 20: Keyword Links: Improve .....	67
Figure 21: Keyword Links: Employees .....	67

## **List of Appendixes**

Appendix A: SERVQUAL – Proposal Development Unit.....	98
Appendix B: SERVQUAL –Proposal Submission Unit.....	103
Appendix C: SERVQUAL – Post- Award Division.....	108
Appendix D: Institutional Review Board Approval .....	113
Appendix E: Notice to Researchers .....	114
Appendix F: Individual Reminder to Researchers.....	115

## **1 INTRODUCTION**

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Institutions of higher education have the great responsibility of providing society with new ideas, innovations, and technological advances that have a positive social impact. Their social responsibility involves investigating and creating solutions to global problems, both academically and through research. Pursuing this aspect of their mission involves particular challenges that have led to the growth of sponsored program offices and research administration professionals, who must act as institutional stewards while providing direct services to university investigators. These challenges are: the management of research funds in compliance with applicable regulations; reducing investigators' administrative burden; and protecting the integrity and credibility of the institution in front of external agents.

Research Administration Centers must navigate a dual role: they must address compliance functions while maintaining an excellent level of service quality to build productive relationships with key stakeholders, leading to the positive development of the research environment. For this reason, it is important to establish baselines and monitor investigators' opinions and expectations about the services they receive. In this research project, a SERVQUAL questionnaire was developed and adapted to the context of Research Administration, and then administered and validated through a case study at the University of Puerto Rico Mayaguez (UPRM) Research & Development Center (R&DC). The outcome was the development of a tool to measure perceived service quality expectations within the context of Research Administration Centers. The following sections provide greater detail about the ever more important role played by Research Administration Centers in modern universities and their interaction with institutional staff and faculty, making them an important subject of study in the field of service quality.

## **1.1 Need for Supervision and Administration of Research Funds**

Sponsored research requires an investment of grant dollars, in which institutional, private, state, and federal funds play fundamental roles. However, economic limitations over the past decades have highlighted the role of Research Administration Centers as stewards of external funds. Some reasons of the lack of funds are: a decrease in federal and state funds, an increasing number of traditional, and non-traditional students and limitations on much they can charge for tuition (Manson & Learned, 2006). Economic recession has affected all institutions of higher education, particularly those that are publicly funded. The budget that the government assigns to universities has been reduced. Therefore, universities seeking to mitigate the economic limitation have chosen to seek funding through external sources, and face increasing pressure to ensure their productive management (Kirby, 1992). Greater accountability and transparency requirements impose a constantly increasing compliance burden for institutions of higher education. Focusing exclusively on these important factors can have a negative effect on service quality and investigators' perception of research administrators. Rogers and Gallant (2016) highlight both the importance of the research administrator and the possible perception problem it faces when they say, "We are not just number-crunchers, rule-makers, bureaucrats, obstacles, secretaries, pen-pushers, paperwork-lovers, nine-to-fivers; we are guardians of research and protectors of our tax dollars!".

## **1.2 Need to Protect University Credibility When Facing External Agencies**

The offices of research administration oversee enforcing institutional norms, and are the link between funding agencies and the institution of higher education. They play a fundamental role in interpreting and following guidelines and ensuring fulfillment of institutional, state and

federal regulations (Manson and Learned, 2006). In this way, the risk of committing errors through the application and fund management processes is mitigated.

A case where the importance of the efficient performance of an office of research administration is evidenced occurred in 2012, when the National Science Foundation (NSF) temporarily suspended funding for the University of Puerto Rico, after a research funding relationship of 30 years (Martínez, 2013). The cause of this incident was the possible mismanagement of funds due to errors in reporting investigators' worked hours. This situation put at risk the research relationship with the NSF and presented the possibility of a permanent loss of an important source of research funding. This problem would have caused a loss of 20 million dollars for research projects (Grau, 2013). Another case occurred in 2008, when the National Institutes of Health (NIH) suspended a \$9 million grant for a depression study led by a psychiatrist at Emory University in Atlanta. This situation occurred because NIH-funded researchers have failed to report all their income from drug companies. This situation had consequences for Emory University, such as the imposition of special award conditions on all NIH grants to the institution.

### **1.3 Need to Reduce Investigators' Administrative and Procedural Burden to Allow More Time for Research.**

Growth of external research funding sources with diverse management and compliance requirements has increased demand for research administration offices in universities, as investigators try to obtain sponsored program funds and manage them in an efficient manner. Excellent offices of research administration play a strategic role in guiding institutions through a highly competitive research environment (Lintz, 2008). One function of these offices is to find and communicate new sponsored program opportunities, while strategically inciting faculty to employ their time in resolving critical challenges that are faced today (Kakande, Namirembe, Kaye and

Mugenyi, 2012). Moreover, these offices should specialize in administrative procedures related to the proposal submission process and the fund management process, with the purpose of reducing investigators' administrative workload for funded research. The complexity of these processes, which include working with different electronic research administration systems and regulatory environments, has greatly increased over time and is expected to continue doing so (Rogers and Gallant, 2016)

Considering these needs and priorities, it is necessary for offices of research administration to balance regulatory compliance with providing excellent services, making necessary adjustments according to investigator expectations and perceptions about quality services. This will allow them to be more productive offices, improving the institutional research environment, and increasing the number of proposals submitted and approved. Furthermore, in the same way that research administration offices must manage external funds in an effective and efficient manner to maintain productive relationships with funding agencies, they must also meet the service quality expectations of investigators, the principal clients of their offices, to maintain credibility and develop positive recognition.

Research administration centers provide direct services to investigators. To achieve the goal of establishing and maintaining excellent offices it is necessary to first do a diagnostic analysis and establish a baseline, with the purpose of identifying possible areas of improvement. The investigators who receive the services are the key stakeholders, who can recognize and communicate problems in the system through the evaluation of the services received versus the service expected. For this purpose, this research project adapts a SERVQUAL questionnaire to the context of research administration, and carries out a case study at the R&DC.

The principal objective of the study was to develop an adapted control instrument based on the SERVQUAL model that can be used to evaluate the perception of service quality in a Research Administration Center. Additional objectives were:

- Identify which dimensions from the SERVQUAL model are considered the most important when assessing perceived service quality in a Research Administration Center.
- Conduct a case study in the Research and Development Center (R&DC) at UPRM in which the clients would receive a survey to evaluate the perceived quality of service received.
- Analyze the responses of the questionnaires from the clients of the UPRM R&DC.
- Identify strengths in the services offered by the UPRM R&DC.
- Identify critical areas that require monitoring or attention at the UPRM R&DC.



## 2 LITERATURE REVIEW

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The literature review for this project focuses on three main areas: service quality, measurement of service quality, and service quality in research administration.

### 2.1 SERVICE QUALITY

There is a significant body of work dedicated to defining service quality and how it can be measured. Several authors have highlighted the differences between evaluating the quality of a service and the quality of a good. The main difference between these two concepts is that indicators such as durability and number of defects can objectively measure quality of a good, while quality of a service must be measured abstractly (Garvin, 1983). Sunayna (2013), Lempts et al. (2012), and Parasuraman, Zeithaml and Berry (1985) attribute the difficulty in its measurement to intrinsic factors unique to services: intangibility, heterogeneity and inseparability of production and consumption. Due to the particular characteristics of services, a proper approach for assessing the quality of services is through the measure of customer perceptions of quality (Yarmen and Sumaedi, 2016).

Gronroos (1984) argues that the quality of service is determined by customer perceptions and expectations about the service (Reboloso-Pacheco et al, 2005). Customers make a conclusion about the quality of a service received by comparing the level of the service provided to them with their own personal expectations, shaped by experience (Sunayna, 2013). The outcome of this comparison was named “Perceived Service Quality” by Gronroos (1982) and (1984), Takauchi and Quelch (1983) and Parasuraman et al (1985) and (1988).

Perceived service quality was also defined as the degree and discrepancy between service expectation and actual service performance. It shows how well performance is meeting customer

service expectations (Phiri and Mcwabe, 2013). Parasuraman et al (1988) make the clarification that perceived quality “is the customer global attitude or judgment related” to the overall excellence or superiority of a service; it differs from satisfaction, which is associated to a specific transaction. However, these two concepts are related, because individual occurrences of satisfaction over time influence perceptions of service quality.

Some researchers have posited that there may be a difference between quantifiable service quality indicators and the customer’s perception about the quality of service received. In other words, a service may have a high actual service quality according to internal metrics, but the customer may perceive that the service has a lower level of quality (Phiri and Mcwabe, 2013). For that reason, Walker et al proposed to evaluate quality of service from two perspectives: (1) for the service provider, “the intrinsic quality of the design of what is offered and how it’s managed” (Lepmets et al, 2012, p.8); and (2) for the customer, “the extrinsic quality about what is provided to and experienced by customers” (Lepmets et al, 2012, p.8). In the research literature, the latter perspective has been described in great detail and will be the focus of this research. An example of this is the disconfirmation paradigm, a concept put forth by Gronroos (1982), Parasuraman et al (1985 and 1988), Oliver (1980), according to which “service quality is a result of the comparison between perceived and expected service performance” (Sunayna, 2013).

There has been a substantial effort devoted to assessing the quality of a service, as this is an essential aspect of ensuring improved operations in an organization. This process allows the company to make the necessary adjustments and provides services adapted to the needs of customers (Bitner and Zeithaml, 2000). In addition, this helps a company remain profitable in the current competitive environment. (Parasuraman, Zeithaml and Berry 1985)

## **2.2 MODEL TO EVALUATE QUALITY OF A SERVICE**

Service quality literature has seen a significant increase in recent years. Sultan and Ying Wong (2010) pointed out that “most of these studies have concentrated their findings on the dimensionalities of service quality across industries, cultures and firms”.

There are various models to evaluate the dimensions of service quality. The development of these models has sparked a controversy that revolves around the number of dimensions that are relevant and applicable to a specific industry. This controversy has awakened a remarkable interest in the delimitation of service quality categories (Rebollosa-Pacheco et al, 2005). Two service quality models stand out in the literature as being the most widely adopted by researchers: the Nordic model, belonging to the European school and popularized by Gronroos (1982, 1984); and the SERVQUAL model, proposed by Parasuraman, Zeithaml and Berry (1985, 1988, and 1991) and belonging to the American school. (Sultan and Ying Wong, 2010)

Grönroos (1984), in his initial measure model, proposed defined service quality as consisting of three dimensions, namely technical quality (outcomes), functional quality (processes) and corporate image. Technical and functional quality combine to shape the corporate image, which is the customer’s perception of the service received (Blythe, 2013, Grönroos, 1984). According to Grönroos (1984), there is an interrelation between technical and functional quality, but since “the performance of staff in direct contact with customers can compensate for a lower technical quality” (Blythe, 2013), functional quality is a more important factor in determining customer perceptions of service quality (Grönroos, 1984). In 1990 Grönroos revised his model to identify six dimensions of service quality (Sunayna, 2013). However, the first version of his model continues to be the most used and referenced.

The competing model from the American school, SERVQUAL, is “a conceptual service quality model able to facilitate the monitoring of clients’ service quality expectations and performance” (Gorringe and Hochman, 2006). It has seen significant worldwide adoption as a useful service quality measurement instrument (Dahan et al, 2016). According to Bayraktaroglu and Atrek (2010) “SERVQUAL assumes that the difference between the customers’ expectations about a service and his or her perceptions of the service actually received determines the quality”. Parasuraman, Zeithaml and Berry (1985) developed the SERVQUAL theory, and the first version of this instrument identified 10 dimensions of service quality and consisted of 97 items. Later Parasuraman et al. reworked these 10 dimensions into five, which are: tangibility, reliability, responsiveness, assurance and empathy (1988). The most current version of SERVQUAL was launched in 1991 when Parasuraman et al. made the final improvements and adjustments to the original instrument, but kept the same five dimensions. The focus of each dimension is the following:

- 1) Tangibles: physical facilities, equipment, and appearance of personnel.
- 2) Reliability: Ability to perform the promised service dependably and accurately.
- 3) Responsiveness: Willingness to help customers and provide prompt service.
- 4) Assurance: Knowledge and courtesy of employees and their ability to inspire trust and confidence.
- 5) Empathy: Caring, individualized attention the firm provides its customers.

The instrument measures the gap between performance and expectation through a 22 item Likert Scale survey, which are aligned under these five dimensions.

SERVQUAL “has been empirically examined widely” (Sultan and Wong, 2010, p. 261) and “is a best-known service quality measurement model” (Sukwadi, Yang, and Fan, 2012, p.385), but there have also been conceptual and empirical criticisms leveled against it. Bayraktaroglu and Atrek (2010) explain that there can be issues with “understanding customer expectations, use of the gap approach for service quality, and unsuitability of the measurement tool for use in different industries”. There might also be problems related to “low reliability, poor convergent validity, and poor predictive validity” (Bayraktaroglu and Atrek, 2010). In response to these perceived shortcomings, Cronin and Taylor (1992) argued that the gap approach is not adequate for evaluating service quality, and proposed another approach that is exclusively based on current performance. This model is called SERVPERF and is a modification of SERVQUAL.

Studies conducted by Bayraktaroglu and Atrek (2010) and Carrillat, Jaramillo, and Mulki (2007) have evaluated the superiority of these two models. Bayraktaroglu and Atrek’s (2010) findings “revealed that both instruments had a good fit for the five-factor model, which indicated a good construct”. Carrillat, Jaramillo, and Mulki (2007) also found that both scales can be successfully used to predict service quality. The literature shows that despite the criticisms raised, SERVQUAL retains its usefulness and can be used to provide an accurate measure of customer perceptions (Jiang, Klein, and Crampton, 2000; Ladhari, 2009).

Bayraktaroglu and Atrek (2010) stated that “a number of researchers have applied this model to various industries, including the hospitality industry, academic institutions, the tourism industry, the healthcare industry, banking, and the retail industry”. Another possible SERVQUAL model application is its use by Research Administration Centers. Because this field is relatively new, SERVQUAL is not yet frequently used. However, the limited literature on its use confirms

that with an adequate adaptation of the instrument, it can be utilized by centers to monitor client service quality expectations and performance (Gorringe and Hochman, 2006).

### **2.3 SERVICE QUALITY IN A RESEARCH ADMINISTRATION CENTER**

Research administration is defined as “an academic support function that facilitates research activity through the administration of grant applications for internal and external resources” (Drummond 2003). It is a specialized field with functions relevant to “institutions of higher education, industrial research laboratories, and independent profit and not for profit research companies, medical research institutions and government research laboratories and centers”. (Beasley, 2006)

In the beginning of the 20<sup>th</sup> century, before World War II, scientists and their research staff members had the responsibility of research administration (Beasley, 2006). During World War II, the United States federal government created the Office of Scientific Research and Development (OSRD) to coordinate research development for military purposes during the war (Rothenberg, 2001). The creation of OSRD had significant long-lasting consequences beyond the war effort; after the end of the war OSRD ceased its functions, but some universities continued having an OSRD Research Center to provide basic support for research and discoveries. This situation highlights the importance of the services this sort of centers provide, assisting in the management of research (Beasley, 2006).

In the years after World War II (1945), institutions of higher education faced the challenge of securing outside contracts and grants to advance knowledge, build facilities and attract proficient researchers. These changes demanded a new administrative structure to manage the compliance requirements that accompanied these external funds, and to coordinate campus

research activities. This new function was called research administration. Research administrators emerged as a new type of professional position and the field engaged in rapid growth throughout the 20<sup>th</sup> Century (Beasley, 2006).

Various organizations were created to support the new concept of research administration, debate practices and exchange knowledge. The first organization was the National Conference on the Advance of Research (NCAR) in 1947. Other four organizations were: the Council on Government Relations (COGR) in 1948, the University of Denver Biennial Conference on Research Administration in 1954, National Council of University Research Administration (NCURA) in 1959, and the Society of Research Administration (SRA) in 1967. These five organizations have had a strong impact on the development of research administration and the growth of the profession (Beasley, 2006).

Research administration centers were traditionally focused on the management of the internal operation encompassing grant administration. However, recent changes are redefining the research administration role and refocusing its attention outward towards research results (Valentine, 1992). This shift provides new opportunities for the professional growth of research administrators (Cole, 2007). Currently, a research administration center has the following responsibilities: “1) the conduct of research and its impact on the entire organization, and 2) the oversight and compliance of the sponsor’s management and fiscal requirements as stated in the grant or contract” (Beasley, 2006, p. 9). However, research administrators face many threats, pressures, and challenges in response to current internal and external demands. The principal threat is the decrease of funds for research by governments (Killoren and Raymond, 1997). Another threat, related to the first, is the lack of standard methods or metrics to measure and compare the performance of research administration with the purpose of enhancing

competitiveness and success of the research enterprise (Marina, Davis-Hamilton and Chamanski, 2015).

Performance metrics represent “measures used to evaluate and improve the efficiency and effectiveness of business process” (Cole, 2010). Examples of quantitative metrics used in the field of research administration include “success rate (number of submitted proposals accepted for funding), dollar amount of funding applied for and received, and number of applications submitted”. (Marina, Davis-Hamilton and Chamanski, 2015, p.95). Qualitative data can be obtained from customer feedback on research administration services (Marina, Davis-Hamilton and Chamanski, 2015). There are several benefits that research administrations centers could obtain from the development and use of performance measures. Some of them include: facilitating evaluation of staff performance, more accurately defining duties, managing expectations, and establishing the necessary structure to supervise internal operations and their impact (Haines, 2012). These benefits can be summarized in three main areas: “changing behavior, driving performance, and supporting investments in research administration” (Taylor, Lee, and Smith, 2014).

According to Davis-Hamilton and Chamanski (2015), it is very important to support investigators with adequate resources. For this reason, the availability of resources in the center must be in accord with the needs of the researches. To achieve this, it is essential to evaluate the quality of the services offered by a research administration center. Additionally, the continued assessment of services offered can help identify additional resources required to meet the changing needs of faculty and obtain a competitive advantage (Marina, Davis-Hamilton and Chamanski, 2015). Janice Besch, Managing Director of the National Institute of Complementary Medicine at the University of Western Sydney, stated that “researchers require robust management systems to



support their activities in a funding environment that is highly competitive and carrying a significant compliance burden. If they are not well supported, they are likely to scale down, or fail in, their grant seeking activities; funding will diminish; and there is a risk that whole research programs could be shut down due to compliance breaches” (Besch, 2014). Besch’s words highlight the importance of research support functions; the stakes are high, and institutions that carry out research must take the necessary steps to ensure its research administration services respond to investigator needs while measuring and acting upon the quality of the services provided.

The Society of Research Administrators (SRA) International in 2014 undertook an informal survey of performance measurement in research administrators and found that 78% of those who responded conduct some kind of evaluation of their services (Davis-Hamilton, 2014). Another finding was that the most commonly used evaluation methods are informal feedback from customers, analysis of existing reports and data, and comparison of internal business process data period to period (Marina, Davis-Hamilton and Chamanski, 2015). From the available literature, some client experience feedback initiatives in research administration have been carried out. One example of a client feedback study is Cole’s (2007) study of faculty at several research universities, which circulated via email an informal online survey asking faculty what services they found deficient in existing research administration structures and what changes were needed. Another study was carried out by the Office of Management of Research Projects of the University of South Australia (UniSa), which analyzed data from client feedback via annual client surveys; the institution used the information collected to assess the extent to which clients value the services received (Gorringer and Hochman, 2006), and acted accordingly. These surveys have been used in several research administration centers, and those who use these qualitative measures report overall high-quality, useful data (Marina, et al, 2015).

Though many individual centers have taken steps to measure and evaluate their work, it is evident that there is still a lack of “an effective, evidence-based metric standard that captures the complexity of the field” (Marina, et al, 2015). Zoya Davis-Hamilton highlighted this lack of standardization as having “far reaching consequences”. It leads to questions about the validity of office evaluation efforts, and complicates or precludes comparisons between institutions and offices (Davis-Hamilton, 2014). This study contributes to the advancement of knowledge in this area, specifically addressing the problem of standardization of metrics pertaining to service quality.

The purpose of this study was to generate a formal standardized qualitative tool; this was based on adaption of the SERVQUAL instrument. This can be used by all research administration offices or centers, allowing them to evaluate their performance from the perspective of their customer, and to compare their performance with others for the purpose of making improvements and offering competitive services.

### 3 METHODOLOGY

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#### 3.1 DATA COLLECTION

This study utilized a case study methodology. A SERVQUAL instrument adapted for use in a Research Administration Center was developed, with the purpose of evaluating the perceived quality of a service. The case study took place in the Research and Development Center (R&D Center) of the University of Puerto Rico Mayaguez Campus (UPRM). The rationale for case selection was the availability of access to the R&D Center and its potential contribution to local knowledge, as this was the first diagnostic evaluation of overall service quality at the R&D Center. However, the overall goal also involves generating data that is useful beyond the boundaries of Puerto Rico and that can help advance knowledge pertaining to service quality evaluation in the field of research administration.

The literature suggests that the SERVQUAL should be adequately adapted for a specific industry or specific study context in order to gather valuable information (Sultan and Wong, 2010). Therefore, in this study the SERVQUAL questionnaire was adapted for each service area offered to researchers from the R&D Center. The Center's structure has two main customer-facing divisions: the Pre-Award Division, and the Post Award Division. The Pre-Award Division is composed of the Proposal Development Unit (PDU) and the Proposal Submission Unit (PSU). The nature of Pre-Award Division services at the R&D Center entails that these units may serve different clients, and they are located in different facilities. The R&D Center Post Award division, on the other hand, is comprised of the offices of Budget, Human Resources, Finance and Accounting, and Purchasing. These offices occupy contiguous workspaces within the same building and they share the same clientele.

As a consequence of the conditions described above, this study developed three instruments. These were adapted, with the support of a specialist from each service unit, to adjust the items to the context of the Proposal Development Unit (Appendix A), the Proposal Submission Unit (Appendix B), and the Post-Award Division of the R&D Center (Appendix C). Each questionnaire is composed of two parts. The first one consists of the adapted SERVQUAL instrument, which has two sections, with a slight structural modification due to changes in the order of the dimensions and the number of items used. The order used was Responsiveness, Reliability, Assurance, Empathy and Tangibles, rather than the original order proposed by Parasuman et al (1991): Tangibles, Reliability, Responsiveness, Assurance and Empathy. The first section evaluated the expectations when receiving services in an ideal, excellent office. It has 24 items for the PDU and PSU, and 22 items for the Post Award Division. The second section assessed the perception of the actual services received from R&D Center UPRM offices, with the previously mentioned number of paired items for each questionnaire. A 7-point Likert scale was used where ratings varied from 1 corresponding to Completely Disagree to 7 corresponding to Completely Agree. The second part included a series of demographic multiple-choice questions aimed at collecting general information about the users, and one open-ended question that gave participants the opportunity to provide comments and offer specific suggestions for improving R&D Center services.

These questionnaires were provided to participants through an online platform called Qualtrics. Each participant received a survey specifically designed to evaluate the services they have received during the past three years from the R&D Center, calculated from the date the survey was first distributed (February 2016). The population was chosen because they are the direct beneficiaries of the services offered by the R&D Center, and therefore, they provide valuable

information and the insight needed to make improvements to those services. It is important to note that an individual investigator may have utilized the services of multiple units over the previous three years, and therefore may be counted as a participant in more than one unit. For the purpose of demographic data, these investigators were only counted once.

For the Proposal Submission Unit, the population was composed of 179 Principal Investigators who had received its services in the past three years, according to an electronic research administration database called Kualu Coeus. The studied population for the Proposal Development Unit was the 60 researchers that had received services during the specified timespan, according to the office's Customer Relationship Management database. This unit maintains its own record of investigators that utilize its services, which allowed the preparation of a survey specifically targeting this population. The PDU had the smallest number of potential participants, due to the nature of the services it provides. While the Proposal Submission Unit and the Post Award Division provide services that all active investigators must use to comply with university regulations, requesting services from the Proposal Development Unit is voluntary and the decision is in each individual investigator's hands.

For the Post-Award Division, the initial selected population was 212 participants, composed of all principal investigators and all co-investigators that had an active project managed by the R&D Center and logged through Kualu Coeus at the time of the survey. The initial number of possible participants was 212, but 18 investigators had to be excluded from the study based on the nature of their position and/or lack of interaction with R&D Center Services. Some R&D Center account-holders were logged in the record system based on their administrative roles (department chairs, deans, etc.) rather than due to research-related purposes. Others were linked to

an open but inactive account at the R&D Center, and had not requested any Post Award services during the previous three years. The final number of possible participants was 194.

A potentially low return rate for surveys among faculty was one of the challenges faced in this study. Cole (2007) indicated that one survey reported only 11% response rate, and Mullen et al. (2008) stated a 20.6% response rate. In a study conducted at a Research Administration Center with the purpose of assessing perceived service quality, the response rate during four years of surveys ranged from 34 to 40% (Gorrige and Hochman). Accordingly, the target response rate for this study was initially 35%. By the time survey access was closed on May 2016, we achieved participation rates of 47% for the Proposal Development Unit, 47% for Proposal Submission Unit, and 45% for the Post-Award Division.

Survey responses were collected from February 2016 to May 2016. The questionnaires were initially distributed through the official R&D Center email address, and the request was signed by the director. A monthly reminder was sent to investigators through the official email address. Due to the low response rate at the beginning of the survey period, it was deemed necessary to ask for the collaboration of some R&D Center employees. These employees used their institutional email addresses to send the participation request and questionnaire link to all potential participants, capitalizing on their established relationship with investigators to improve survey participation. It was also necessary to physically visit investigator offices and explain the importance of the study for improving the services offered by the R&D Center. For this visit, individualized flyers were made with the specific link each investigator must follow to answer the questionnaires about the service unit (or units) they interacted with (Appendix F). Additional flyers were put up around the R&D Center premises, in areas investigators frequent, asking them to answer the survey they received via email (Appendix E).

Another strategy to obtain more responses was reaching out to the College of Engineering's Dean of Research, who provided a time slot during a deanship meeting to present the initiative to department chairs and request their assistance following up with their faculty and promoting their participation. As the deanship of engineering had the largest amount of faculty receiving services from the R&D Center, this was intended to be a time-efficient strategy to increase survey response rates.

A total of 202 completed questionnaires were collected, with a total of 110 participants. The questionnaires were distributed the following way: Proposal Development Unit - 29 questionnaires; Proposal Submission Unit - 85 questionnaires; and Post Award - 88 questionnaires.

## 4 DEMOGRAPHIC CHARACTERISTICS

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Two hundred two (202) questionnaires were collected from 110 participants. Some investigators receive or have received services from more than one unit over the last three years, and consequently completed more than one questionnaire. Out of the total number of participants, 79 possessed a Ph.D. (71.8%), 26 carried out Postdoctoral studies (23.6%), and 4.5% had a Master's degree. Most of the researchers that receive R&D Center services belong to the College of Engineering (41.8%) and the College of Arts & Sciences (40.9%). A small number of participants are from the College of Agriculture, the College of Business Administration, or Sea Grant.

Thirty-one (31) participants (28.2%) did not have an active grant administered by the R&D Center at the moment they completed the survey. The remaining 79 participants had at least one active grant or contract through the R&D Center. It is important to note that 26 participants (23.6%) had four or more grants or contracts administered by the R&D Center at the time of the survey. The average number of proposals submitted by investigators over the previous two years was 0-3 (54.55%), followed by 4-7 with 39.09% of all participants. In regards to the amount of funds managed for individual investigators by the R&D Center (estimated total over the life of the grant), 45.45% (50 participants) selected "more than \$500,000." The next highest portion of participants (27) selected \$100,001-\$500,000.

The majority of participants (63.64%) have used R&D Center services for over five years. A smaller portion (7.25%) had been using R&D Center services for less than six months at the time of the survey. Therefore, most investigators that participated in the study had knowledge about the workings of the offices at the R&D Center, and about its employees, based on years of experience utilizing their services. Additionally, 30.84% of participants have held positions as



Principal Investigator (PI) and Co-Investigator (Co-PI) on externally funded research projects, followed by 26.17% that have only been PIs. Fourteen-point ninety-seven percent (14.97%) have been Key Personnel on a project in addition to their experience as PI and Co-PI. Another noteworthy demographic characteristic is that 35 investigators have had experience receiving research administration services at other institutions, and 74% of these researchers obtained this experience at a research-intensive university.

From the demographic data obtained, the information on proposals developed and submitted, and the number of individual projects and grant funds administered by the R&D Center, it can be concluded that the workload at the R&D Center units is demanding, high-volume and time-intensive. This work places a large burden of responsibility on employees in order to carry out all relevant obligations and processes in compliance with university and sponsor regulations.

## 5 GAP ANALYSIS

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To gauge investigators' perception of the quality of service received, a gap analysis was performed. A gap analysis is a method of assessing the differences in performance and expectation level of clients from a service. The individual item gap score quantifies the difference between investigators' expectations and their perception. The gap score for each quality dimension is calculated by subtracting the perception mean value from the expectation mean value. This calculation was performed for each researcher-facing service unit of R&D Center (Proposal Development Unit, Proposal Submission Unit and Post-Award Division). Tables 1, 4 and 7 provide an overview of the perception, expectation, and gap score for all quality dimensions in each unit. A positive value in the gap column indicates the existence of a service quality deficiency; a dimension where investigators' expectations are not met by actual service performance. Conversely, a negative value in the gap column indicates a dimension where service exceeds expectations.

Tables 3, 6 and 9 provide a detailed breakdown of expectation, perception, and gap scores for each of the five dimensions' individual items, averaging investigators' opinions regarding each item. Additionally, the result of a hypothesis test (p-value) is provided. The significance of the gap score for each item is indicated by its p-value, provided for each item. The null hypothesis was that perception score is equal to expectation score; that is, the gap score is equal to zero. The alternative hypothesis was that there is a difference between the two scores. The hypothesis test verifies whether there is a significant difference between the quality of service the investigator is expecting to receive and that of the actual service they are receiving. On a scale from 0 to 1, the closer the p-value is to 0, the greater statistical significance in the gap, which warrants further analysis. In this study, our significance level  $\alpha$  was set at 0.05. This analysis must consider the gap

score, relative priority ascribed by investigators to the corresponding dimension, and relevant investigators' comments to contextualize the p-value score. The hypothesis test performed was a paired t-test for each item of the questionnaire in each dimension studied.

For this study, we propose that a negative gap score in an item indicate a strength in the corresponding unit. A gap score between 0 and 0.1 in an item would indicate a mild deficiency. If a positive gap score is large in an item, it must be considered a critical item that requires targeted improvement.

### **5.1 PROPOSAL DEVELOPMENT UNIT GAP ANALYSIS BY QUALITY DIMENSION**

Twenty-nine (29) investigators answered the questionnaire about the Proposal Development Unit's services, for a 47% response rate. Table 1 provides the expectation, perception, gap score for each quality dimension. From this data, we can conclude that the Proposal Development Unit's clients perceive high quality in the services received, as its average gap score across all dimensions was only 0.0492 (see Figure 1), the lowest among the units involved in the study. This was the only R&D Center unit to obtain a negative dimension gap score value, indicating that the performance of the Proposal Development Unit in the *empathy* dimension satisfies and exceeds the expectation investigators have for the service. The *empathy* dimension focuses on employees' aptitude to perform their function, and SERVQUAL data indicates that this is a strength of this unit. The other dimensions have positive gaps, but in general these gaps are small. The largest gap of the four dimensions occurs in *reliability*, with only 0.117. Rather than indicating critical areas, these small gaps point to the perception that service quality levels across the unit are close to investigator expectations.

Table 1: Quality Dimension for the Proposal Development Unit

N=29	Exp	Per	Gap
<b><i>Responsiveness</i></b>	6.397	6.310	0.087
<b><i>Reliability</i></b>	6.510	6.393	0.117
<b><i>Assurance</i></b>	6.620	6.551	0.069
<b><i>Empathy</i></b>	6.469	6.524	-0.055
<b><i>Tangibles</i></b>	5.913	5.885	0.028
<b><i>Average</i></b>	6.3818	6.3326	0.0492

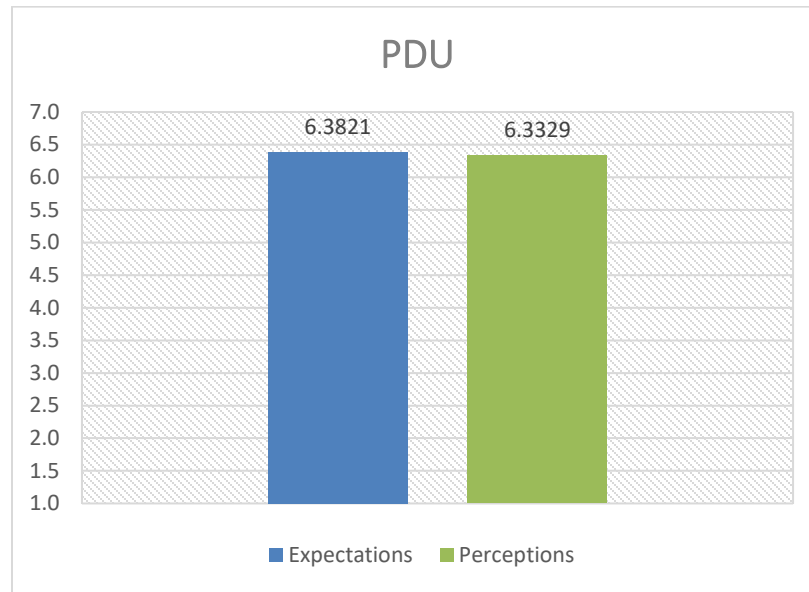


Figure 1: Average Score for the Proposal Development Unit

Figure 2 shows the relative priority ascribed to each quality dimension by investigators receiving services from the Proposal Development Unit. From this data, we can conclude that the highest priority (28.41%) for researchers is “The Proposal Development Offices’ ability to perform the promised service dependably and accurately,” making *reliability* the most important dimension they are looking to find in an excellent Proposal Development Office. The least important dimension is *tangibles*, with 10.90%.

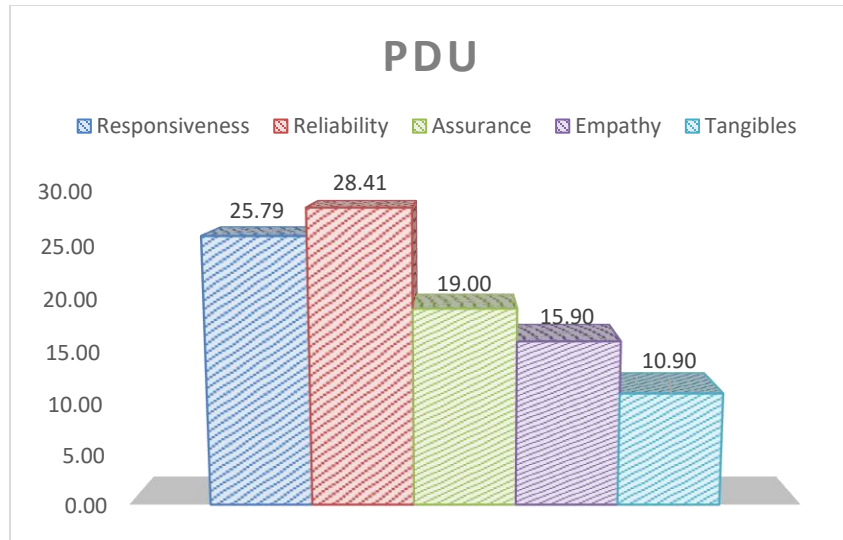


Figure 2: Quality Dimension Priority for the Proposal Development Unit.

## 5.2 WEIGHTED AVERAGE GAP SCORE FOR THE PROPOSAL DEVELOPMENT UNIT

Table 2 shows the weighted gap score for each dimension. This number is obtained by multiplying the average dimension gap score by the average importance weight provided by researchers in the corresponding unit survey (Figure 2).

Table 2: Weighted Gap Score for the Proposal Development Unit (n=29)

Dimension	Average Gap Score	Importance Weight	Weighted Gap Score
<i>Empathy</i>	-0.055	15.9	-0.8745
<i>Tangibles</i>	0.028	10.9	0.3052
<i>Assurance</i>	0.069	19	1.311
<i>Responsiveness</i>	0.087	25.79	2.24373
<i>Reliability</i>	0.117	28.41	3.32397
<i>Total</i>			6.3094
<b>Weighted Average Gap Score</b>			1.26188

### 5.3 PROPOSAL DEVELOPMENT UNIT GAP ANALYSIS FOR INDIVIDUAL ITEMS

Table 3 describes the individual items in each dimension for the Proposal Development Unit. What follows is an item analysis by dimension, incorporating the projected impact that improvement initiatives targeting these areas would have on researchers' perception of service quality. The expected impact is derived from the dimension's priority rank and the item's position above or below the unit's median gap (0.0515).

#### Responsiveness - Priority rank: 2

The *responsiveness* dimension is composed of a time element (work promptness and scheduling) and an attitudinal/interpersonal aspect. For this dimension, the PDU scored below its median gap score (0.0515) on all items pertaining to attitudinal characteristics, and over the median on those items related to promptness and scheduling. On the items "their employees are always willing to help researchers," and "their employees are never too busy to respond to researchers' requests," the gap score was negative, indicating that researchers perceive they are receiving more quality attention from the employees than they expect. These areas are rated as a unit strength, as their gap score is negative.

The item "giving prompt service to researchers" had a small gap score of 0.172, indicating unit performance is close to researcher expectations. The other time-related item, "Telling researchers exactly when services will be performed" was the one with the lowest p-value (0.0086), pointing to a small gap (0.379) between the service expected and the service received in this area. Due to their priority rank and position over the unit median gap score, improvements in these areas are projected to have a high impact on investigators' perception of PDU service quality, with "telling researchers exactly when services will be performed" having the highest impact across all dimensions.

### Reliability - Priority rank: 1

Similar to *responsiveness*, the *reliability* dimension is comprised of a temporal aspect (timeliness) and a professional knowledge aspect. This dimension was the most highly prioritized one among investigators receiving services from the Proposal Development Unit. *Reliability* obtained the highest average positive gap score (0.117) for the PDU, but the individual item gap scores do not exceed 0.276, which is a low value among R&D Center units. Furthermore, the item “Performing the service right the first time” shows a negative gap, which indicates that Proposal Development Unit meets and exceeds investigators’ expectations in regards to accurately performing the requested service.

Conversely, the items related to timeliness reflect the largest positive gaps for this dimension, leading to an appreciable distinction between the accuracy and dependability scores encapsulated in this dimension. The items “providing the service at the time they promise to do so” (0.241) and “promising to do something by a certain time, and doing so” (0.276) have values that exceed the unit median gap score and a priority rank of 1, leading to the conclusion that out of all SERVQUAL-related improvement initiatives the PDU could carry out, targeting these areas will have a relatively higher impact on investigator service quality perception. Overall, PDU performance within this dimension remains close to investigator expectations for employees’ “ability to perform the promised service dependably and accurately” in an excellent proposal development office.

### Assurance - Priority rank: 3

The *assurance* dimension encompasses service quality items related to employees’ knowledge, courtesy, and ability to convey trust and confidence, which lead to the development

of productive working relationships. In this dimension, two items (courtesy and knowledge) were identified as unit strengths, and two (trust and confidence) were classified as having a medium impact potential on service quality perception. The item “their employees being consistently courteous with researchers” has a negative gap, indicating that PDU employees exceed expectations in terms of maintaining positive relationships with investigators during service interactions.

Other items in this dimension show small positive gaps. The item “their employees having the knowledge to answer researchers’ questions” shows the highest p-value (0.712) and the smallest positive gap (0.069), meaning that employee service quality is very close to investigators’ expectations. The items pertaining to researchers’ “feeling safe in their proposal design decisions” and employee behavior “instilling confidence in researchers” exceeded the median gap score for the PDU, and as such were classified as “medium impact” service quality areas in accordance with their priority rank. Overall, we conclude that researchers are largely satisfied in terms of Proposal Development Unit employees’ “knowledge and courtesy [...] and their ability to convey trust and confidence.”

#### Empathy - Priority rank: 4

The *empathy* dimension explores human interaction during the service process, focusing on the “caring, individual attention” provided by PSU personnel to researchers. The *empathy* dimension was the highest-performing for the PDU, with three negative gap scores and two small positive gaps. Three of the items had a negative gap score threshold, and as such are classified as unit strengths: 1) operating hours convenient to researchers (-0.207); 2) providing individual attention (-0.138); and 3) providing personal attention (-0.138). The item that most exceeded expectations was “Having operating hours convenient to all their researchers,” which data shows



to be a significant strength for the PDU. The other high-performing items relate to providing individualized, personal attention and caring for the researchers' best interests, which speaks to the PDU personnel's ability to establish productive working relationships with their clients. The last item, understanding the specific needs of their researchers, had a relatively low gap score that exceeded unit median. Because of its fourth-place priority rank, it is deemed a medium impact area for improvement initiatives seeking to improve perceived service quality.

#### Tangibles - Priority rank: 5

The *tangibles* dimension encompasses physical facilities, equipment, personnel, and communication materials. This dimension reflects one negative gap, and five small gaps that are considered low-impact areas for improvement. The item for "modern looking equipment" shows a relatively high negative gap score (-0.345), indicating that investigators' expectations are significantly exceeded. The PDU staff's neatness in their appearance (0.034), welcoming physical environment (0.034), visually appealing materials (0.103), along with physical facilities (0.172), efforts to improve these service areas are classified as low impact potential due to their relatively small gap scores and low priority ranking among researchers.

Overall, researchers are satisfied with the "Appearance of physical facilities, equipment, personnel, and communication materials" at the PDU. The office provides a welcoming environment with facilities that are conducive to work, which is an added value, as these facilities are made available to investigators who need a private space to work on their proposals. The materials produced by the PDU are considered visually appealing, which assists the office in its knowledge dissemination function.

Table 3: PDU - Item Expectation, Perception, Gap Score, and p-value by Dimension (n=29)

	Expected	Perceived	Gap	T-Value	P-Value
<b>Responsiveness</b>	Mean	Mean	Mean		
Telling researchers exactly when services will be performed	6.414	6.034	0.379	1.78	0.086
Their employees giving prompt service to researchers.	6.448	6.271	0.172	0.89	0.378
Their employees are always willing to help researchers.	6.621	6.655	-0.034	-0.30	0.769
Their employees never being too busy to respond to researchers' requests	6.103	6.276	-0.172	-0.64	0.525
<b>Reliability</b>					
Promising to do something by a certain time, and doing so	6.586	6.310	0.276	1.68	0.103
Showing a sincere interest in solving researchers' problems.	6.724	6.690	0.034	0.24	0.813
Performing the service right the first time	6.414	6.448	-0.034	-0.17	0.865
Providing the service at the time they promise to do so	6.552	6.310	0.241	1.65	0.109
Insisting on error-free documents	6.276	6.207	0.069	0.37	0.712
<b>Assurance</b>					
The behavior of their employees instilling confidence in researchers	6.724	6.552	0.1724	2.42	0.023
Researchers feeling safe in their proposal design decisions.	6.621	6.483	0.138	1.00	0.326
Their employees being consistently courteous with researchers	6.655	6.759	-0.103	-0.83	0.415
Their employees having the knowledge to answer researchers' questions.	6.483	6.414	0.069	0.35	0.730
<b>Empathy</b>					
Giving researchers individual attention	6.552	6.690	-0.138	-1.00	0.326
Having operating hours convenient to all their researchers	6.172	6.379	-0.207	-0.81	0.424
Having employees who give researchers personal attention	6.552	6.690	-0.138	-0.81	0.424
Having their researcher's best interests at heart	6.655	6.621	0.034	0.27	0.787
Their employees understanding the specific needs of their researchers.	6.414	6.241	0.172	0.89	0.378
<b>Tangibles</b>					
Have modern looking equipment.	5.621	5.966	-0.345	-1.33	0.194
The physical environment is welcoming	6.069	6.034	0.034	0.13	0.899
Their employees are neat in their appearance	5.931	5.897	0.034	0.08	0.938
Materials associated with the (pamphlets or statements) are visually appealing	5.897	5.793	0.103	0.43	0.669
The physical facilities are responsive to investigator's workspace needs.	5.966	5.793	0.172	0.69	0.493
The physical facilities are conducive to productive work.	6.000	5.828	0.172	0.76	0.455

	<b>Negative Gap Score (Strength)</b>		<b>Significant Gap</b>
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#### 5.4 PROPOSAL SUBMISSION UNIT GAP ANALYSIS BY QUALITY DIMENSION

Eighty-five (85) investigators answered the questionnaire about the Proposal Submission Unit's services (PSU), for a 47% response rate. Table 4 provides the expectation, perception, gap scores for each quality dimension. From this data, we can conclude that the Proposal Submission Unit's clients perceive high quality in the services received, even though some small adjustments could be made to align perceived service levels and expectations. All dimensions show small positive gaps, but the average gap score across all dimensions was only 0.2044 (see Figure 3). The largest gap of the four dimensions is *tangibles*, with a relatively low value of 0.312, followed by *reliability* with 0.268. Overall, the highest-performing according to investigators are *empathy* (providing caring, individual attention to researchers), *assurance* (employees' knowledge, courtesy, and ability to convey trust and confidence), and *responsiveness* (willingness to help researchers and provide prompt service). The small gaps observed in these dimensions indicate that service quality levels are close to investigator expectations.

Table 4: Quality Dimension Scores for the Proposal Submission Unit (n=85)

Dimension	Exp	Per	Gap
<b><i>Responsiveness</i></b>	6.435	6.258	0.177
<b><i>Reliability</i></b>	6.569	6.301	0.268
<b><i>Assurance</i></b>	6.623	6.464	0.159
<b><i>Empathy</i></b>	6.463	6.357	0.106
<b><i>Tangibles</i></b>	5.937	5.625	0.312
<i>Average</i>	6.4054	6.201	0.2044

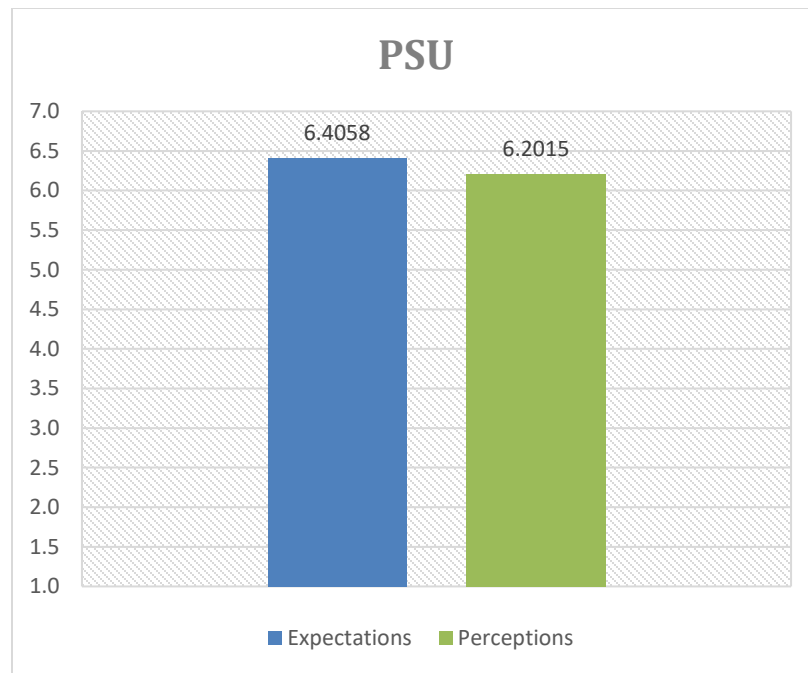


Figure 3: Average Score for the Proposal Submission Unit

Not all service quality dimensions are prioritized equally by investigators. Figure 4 summarizes investigator responses when asked to rate the five dimensions by order of importance to them. It is notable that *responsiveness* is the most important dimension for a Proposal Submission Office of excellence (27.1%), followed by *reliability* (25.45%). This marks a break from investigator responses about Proposal Development Offices and Post-Award Division, where *reliability* has the highest priority. *Empathy*, the highest-performing dimension for the PSU, is ranked 4th with 17.33%. The lowest priority dimension is *tangibles* with 9.78%. This dimension had the largest quality gap (Table 4), but it does not have a strong effect on investigator service quality perception for the PSU since it is considered the least relevant to their evaluation.

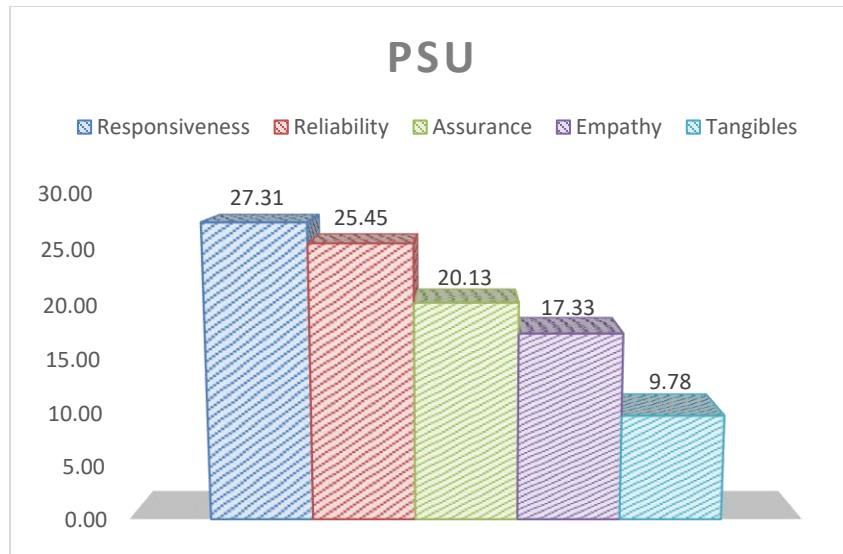


Figure 4: Quality Dimension Priority for the Proposal Submission Unit

## 5.5 WEIGHTED AVERAGE GAP SCORE FOR THE PROPOSAL SUBMISSION UNIT

Table 5 shows the weighted gap score for each dimension. This number is obtained by multiplying the average dimension gap score by the average importance weight provided by researchers in the corresponding unit survey (Figure 4).

Table 5: Weighted Average Gap Score for the Proposal Submission Unit (n=85)

Dimension	Gap	Importance Weight	Weighted Gap Score
<i>Empathy</i>	0.106	17.33	1.83698
<i>Assurance</i>	0.159	20.13	3.20067
<i>Responsiveness</i>	0.177	27.31	4.83387
<i>Reliability</i>	0.268	25.45	6.8206
<i>Tangibles</i>	0.312	9.78	3.05136
<i>Total</i>			19.74348
<b>Weighted Average Gap Score</b>			3.948696

## 5.6 PROPOSAL SUBMISSION UNIT GAP ANALYSIS FOR INDIVIDUAL ITEMS

Table 6 describes the individual items in each dimension for the Proposal Submission Unit (PSU). What follows is an item analysis by dimension, incorporating the projected impact that improvement initiatives targeting these areas would have on researchers' perception of service quality. The expected impact is derived from the dimension's priority rank and the item's position above or below the unit's median gap (0.2119).

### Responsiveness - Priority rank: 1

The *responsiveness* dimension is composed of a time aspect (work promptness and scheduling) and an attitudinal/interpersonal aspect. In this first PSU dimension, two items exceed the unit's median gap score for this dimension. The item pertaining to employees providing "prompt service to researchers" has the largest positive service quality gap (0.247) and a p-value of 0.52 (not significant). This indicates that there is a small difference between client expectations and the service offered. The item "telling researchers exactly when services will be performed" (0.212) also shows a positive gap score exceeding the median. Due to this dimension's priority rank, improvement initiatives addressing these areas will have a comparatively high impact on service quality perception. Other items show smaller positive gaps; the highest-performing items within this dimension for the PSU were those pertaining to employees' helpfulness and attitude, where the unit performed higher than on items related to promptness and work schedule certainty. "Their employees are always willing to help researchers" showed a gap score lower than 0.1. Another high-performing item was "their employees never being too busy to respond to researchers' requests." This item's gap score was lower than the unit median, meaning that staff availability to researchers is close to their expectations of an excellent proposal submission office.

We concluded that most investigators are satisfied with PSU staff's willingness to help customers, and further improvements in this area would have limited impact on perceived service quality. It should be noted, however, that the results for these items do not indicate that optimization of staff size and availability is unnecessary, as qualitative data reveals a perception that R&D Center units (and specifically the PSU) are "understaffed" and "overworked." Having additional staff may result other benefits to the unit that are beyond the scope of the SERVQUAL instrument.

#### Reliability - Priority rank: 2

Like *responsiveness*, the *reliability* dimension is comprised of a temporal aspect (timeliness) and a professional knowledge aspect. Almost all items in the PSU *reliability* dimension have a gap score larger than 0.2, which indicates that not all investigator expectations are being met. Three of the items within this dimension exceeded the unit median, indicating that improvement initiatives would have a relatively high impact on perceived service quality. The item with the largest positive gap is "Promising to do something by a certain time, and doing so," with a gap of 0.411 and a p-value of <0.001. This indicates a statistically significant difference that must be contextualized by considering other factors, including gap size and qualitative data. The size of the positive gap does not highlight this as a critical area in need of urgent improvement, and qualitative data provides further insight: some participants point out that the unit is understaffed, with only 3 employees and a high volume of proposals to process, which makes it difficult for personnel to meet 100% of researchers' expectations.

By contrast, the PSU obtained smaller positive gaps in this dimension for the items "Performing the service right the first time," (0.176) and "Showing a sincere interest in solving researchers' problems" (0.2118). Improvements targeting these items would have limited impact

on service quality perception, leading to the conclusion that while scheduling issues may arise, when work is performed it is carried out correctly and meet researchers' expectations.

#### Assurance - Priority rank: 3

The *assurance* dimension encompasses service quality items related to employees' knowledge, courtesy, and ability to convey trust and confidence, which lead to the development of productive working relationships. The PSU stands out for its performance in this dimension: its four items have a positive quality gap smaller than 0.211, an indicator of investigator expectations being nearly fulfilled. All items scored below the unit median gap score, and consequently any improvements to this area would have a limited impact on researchers' perception of service quality for the PSU.

The items "the behavior of their employees instilling confidence in researchers" and "Researchers feeling safe in their proposal design decisions" reflected the largest positive gap, 0.211. The item pertaining to employees' knowledge and capacity to answer researchers' questions also showed a small positive gap (0.188) that is close to matching investigator expectations. The last item evidences that PSU staff treat investigators affably; "their employees being consistently courteous with researchers" shows a positive gap (0.0235).

#### Empathy - Priority rank: 4

The *empathy* dimension explores human interaction during the service process, focusing on the "caring, individual attention" provided by PSU personnel to researchers. In this dimension, the unit obtained its smallest average positive quality gap (0.106). A notable finding is that one of the items resulted in a negative quality gap, indicating that the PSU meets and exceeds expectations in terms of providing personal attention to researchers. Another high-performing item for the PSU



was “giving researchers individual attention” with a small positive gap of 0.018. Pre-Award in general: personnel adhere to high standards and provide a positive experience during their interactions with investigators. The items with the largest positive gap in this dimension were “having operating hours convenient to all their researchers” and “their employees understanding the specific needs of their researchers” (0.224). The gap score for these items is slightly above the median for the PSU (0.2119), and their priority rank is 4. As such, we have designated them a medium impact area for improvement within the unit.

#### Tangibles - Priority rank: 5

The *tangibles* dimension encompasses physical facilities, equipment, personnel, and communication materials. This dimension obtained some of the largest positive gaps for the PSU, in items related to facilities, equipment, and materials. These items were all above the median gap score, with indicates they are falling below investigator expectations. However, the low priority rank for the dimension and relatively low gap score values (when considering all R&D Center Units) lead us to designate them as low impact improvement areas. Qualitative data pertaining to *tangibles* indicates some investigators would prefer that the PSU facilities provided more privacy and had room for larger meetings. A notable outlier in this dimension was “Employees are neat in their appearance,” which had a negative quality gap and was the highest-performing item for the unit.

Table 6: PSU - Item Expectation, Perception, Gap Score, and p-value by Dimension (n=85)

Dimensions and Items	Exp	Per	Gap	T-Value	P-Value
<b>Responsiveness</b>	Mean	Mean	Mean		
Telling researchers exactly when services will be performed	6.376	6.165	0.212	1.57	0.121
Their employees giving prompt service to researchers.	6.529	6.282	0.247	1.97	0.052
Their employees are always willing to help researchers.	6.7176	6.6353	0.0824	0.87	0.388
Their employees never being too busy to respond to researchers' requests	6.118	5.953	0.165	1.01	0.315
<b>Reliability</b>					
Promising to do something by a certain time, and doing so	6.6353	6.2235	0.4118	4.55	<0.001
Showing a sincere interest in solving researchers' problems.	6.7176	6.5059	0.2118	2.35	0.021
Performing the service right the first time	6.329	6.153	0.176	1.49	0.140
Providing the service at the time they promise to do so	6.612	6.306	0.306	2.89	0.005
Insisting on error-free documents	6.553	6.318	0.2353	3.02	0.003
<b>Assurance</b>					
The behavior of their employees instilling confidence in researchers	6.7412	6.5294	0.2118	2.90	0.005
Researchers feeling safe in their proposal design decisions.	6.5529	6.3412	0.2118	2.48	0.015
Their employees being consistently courteous with researchers	6.6588	6.6353	0.0235	0.29	0.770
Their employees having the knowledge to answer researchers' questions.	6.5412	6.3529	0.1882	2.11	0.038
<b>Empathy</b>					
Giving researchers individual attention	6.5529	6.5412	0.0118	0.13	0.901
Having operating hours convenient to all their researchers	6.259	6.035	0.224	1.41	0.161
Having employees who give researchers personal attention	6.435	85 6.506	-0.071	-0.62	0.539
Having their researcher's best interests at heart	6.588	6.482	0.1059	1.08	0.281
Their employees understanding the specific needs of their researchers.	6.482	6.259	0.224	1.92	0.058
<b>Tangibles</b>					
Have modern looking equipment.	5.694	5.376	0.318	1.98	0.051
The physical environment is welcoming	6.059	5.529	0.529	3.19	0.0021
Their employees are neat in their appearance	6.024	6.376	-0.353	-2.47	0.015
Materials associated with the (pamphlets or statements) are visually appealing	5.800	5.541	0.259	1.92	0.059
The physical facilities are responsive to investigator's workspace needs.	5.800	5.365	0.435	2.52	0.014
The physical facilities are conducive to productive work.	6.247	5.565	0.682	4.14	<0.001

	<b>Negative Gap Score (Strength)</b>		<b>Significant Gap</b>
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## 5.7 POST-AWARD DIVISION GAP ANALYSIS BY QUALITY DIMENSION

Eighty-eight (88) investigators answered the questionnaire about the Post-Award Division's services, for a 45% response rate. Table 7 provides the expectation, perception and gap scores for each quality dimension. The data collected shows numerous critical areas and significant opportunity for improvement across all dimensions. Investigators' comments emphasize awareness of the limited resources available to the R&D Center for carrying out Post-Award functions, but the consensus observed in the SERVQUAL data is that there is a large service quality gap between the expected service and the perceived performance of this unit. All dimensions show large positive gaps, with the average Post-Award gap score being 1.767 (see Figure 5). The largest gap of the four dimensions is *responsiveness* (employees' willingness to help researchers and provide prompt service) with 2.190, followed by *reliability* (ability to perform the promised service dependably and accurately) with 2.157. The values reflected in these Post-Award dimensions compose the most significant service quality gaps identified in this study. *Tangibles* was the only dimension to receive a gap score lower than 1. There were no significant unit strengths identified by investigators.

Table 7: Quality Dimension Scores for the Post-Award Division (n=88)

Dimensions	Exp	Per	Gap
<b><i>Responsiveness</i></b>	6.597	4.406	2.190
<b><i>Reliability</i></b>	6.525	4.368	2.157
<b><i>Assurance</i></b>	6.594	4.724	1.870
<b><i>Empathy</i></b>	6.414	4.702	1.711
<b><i>Tangibles</i></b>	5.858	4.952	0.906
<b><i>Average</i></b>	6.397	4.631	1.767

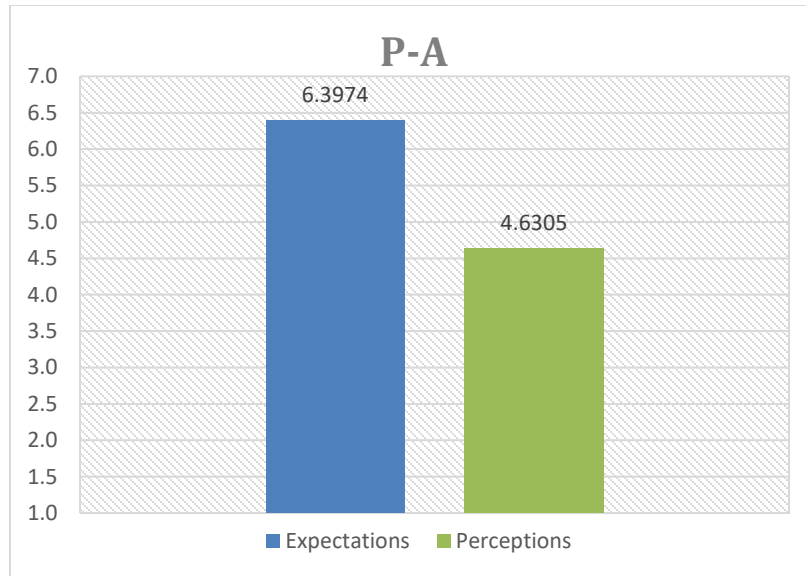


Figure 5: Average Score for the Post-Award Division

Investigators were asked to rank service quality dimensions per their perceived priority. Figure 6 summarizes their responses. The most important dimension for investigators is *reliability* (27.84%), followed closely by *responsiveness* (26.78%). The lowest priority dimension is *tangibles* with 9.27%. This dimension had the lowest quality gap (Table 7), but its low relevance to investigator priorities limits its influence on Post-Award service quality perception. It is notable that even though *empathy* is ranked fourth in priority, the qualitative data collected shows a strong focus on this dimension as an important area for improvement in R&D Center Post-Award Division.

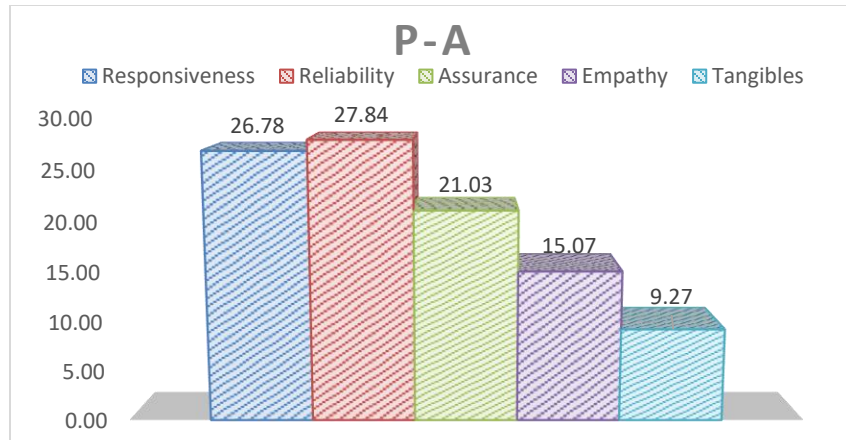


Figure 6: Quality Dimension Priority for the Post-Award Division

## 5.8 WEIGHTED AVERAGE GAP SCORE FOR THE POST-AWARD DIVISION

Table 8 shows the weighted gap score for each dimension. This number is obtained by multiplying the average dimension gap score by the average importance weight provided by researchers in the corresponding unit survey (Figure 6).

Table 8 Weighted Average Gap Score for the Post-Award Division (n=88)

Dimension	Gap	Importance Weight	Weighted Gap Score
<i>Tangibles</i>	0.906	9.27	8.39862
<i>Empathy</i>	1.711	15.07	25.78477
<i>Assurance</i>	1.87	21.03	39.3261
<i>Responsiveness</i>	2.19	26.78	58.6482
<i>Reliability</i>	2.157	27.84	60.05088
<i>Total</i>			192.20857
<b>Weighted Average Gap Score</b>			38.441714

## 5.9 POST-AWARD DIVISION GAP ANALYSIS FOR INDIVIDUAL ITEMS

Table 9 describes the individual items in each dimension for the Post-Award Division. What follows is an item analysis by dimension, incorporating the projected impact that improvement initiatives targeting these areas would have on researchers' perception of service

quality. The expected impact is derived from the dimension's priority rank and the item's position above or below the unit's median gap (2.02).

#### Responsiveness - Priority rank: 2

The *responsiveness* dimension is composed of a time aspect (work promptness and scheduling) and an attitudinal/interpersonal aspect. In this first Post-Award dimension, all items obtained a positive gap score and a p-value of  $<0.001$ , indicating that there is a statistically significant difference between the expected service in an excellent service unit and the perceived quality of the service delivered. The lowest gap score for Post-Award *responsiveness* is 1.989, and the highest is 2.409. Consequently, all areas within this dimension are deemed critical. The items with the most room for improvement are those related to time; 1) providing a prompt service, and 2) telling researchers when a service will be performed. The items pertaining to employees' helpfulness and attitude showed slightly smaller, but still ample quality gap scores. Given the observed gap scores and high priority rank of this dimension, improvement initiatives targeting these items will have a high impact on perceived quality of service.

#### Reliability - Priority rank: 1

Like *responsiveness*, the *reliability* dimension is comprised of a temporal aspect (timeliness) and a professional knowledge aspect. Investigators gave this dimension the highest priority ranking. Like the *responsiveness* results, all items pertaining to Post-Award *reliability* have a p-value of  $<0.001$ , signaling a statistically significant difference between expectations for an excellent service unit and the perceived quality of the service delivered. All items have a large positive gap score threshold, and are designated as critical focus areas. The two highest gap scores belong to the items related to timeliness; 1) promising to do something by a certain time, and doing so (2.352), and 2) providing the service at the time they promise to do so (2.307). The other areas

with high potential for improvement are linked to professional knowledge performing the service right the first time (2.125), and showing a sincere interest in solving researchers' problems (2.091). All items except for "insisting on error-free documents" (1.909) exceeded the Post-Award median gap score of 2.0285. Due to the large service gap sizes and its high priority for researchers, all items within this dimension are designated as high impact areas for improvement initiatives.

#### Assurance - Priority rank: 3

The *assurance* dimension encompasses service quality items related to employees' knowledge, courtesy, and ability to convey trust and confidence, which lead to the development of productive working relationships. Like the previous two dimensions, all items pertaining to Post-Award *assurance* have a p-value of  $<0.001$ , signaling a statistically significant difference between the service expected in an excellent office and the perceived quality of the service delivered. All items have a large positive gap score threshold, and are designated as critical focus areas. Two of the items in this dimension are below the Post-Award gap score median (2.02), resulting in a standard "medium impact" classification, and two are above the median, raising their impact classification to "high." Critical-medium impact items for Post-Award *assurance* are: "being consistently courteous with researchers" (1.375), and "having the knowledge to answer researchers' questions" (1.739). Critical-high impact initiatives would target 1) "behavior of employees instilling confidence in researchers" (2.080) and 2) "researchers feeling confident performing transactions" (2.284).

#### Empathy - Priority rank: 4

The *empathy* dimension explores human interaction during the service process, focusing on the "caring, individual attention" provided by Post-Award personnel to researchers. Like the

previous three dimensions, all items pertaining to Post-Award *empathy* have a p-value of <0.001, signaling a statistically significant difference between the service expected in an excellent office and the perceived quality of the service delivered. All items have a large positive gap score threshold, and are designated as critical focus areas. Three of the items fall under the Post-Award gap score median, resulting in a standard “medium impact” classification, while the two items that scored above the median are raised to “high impact” for the purpose of improvement initiatives. Within this dimension, changes to operating hours (1.375), and individualized (1.443), personal attention (1.466) to researchers are classified as a medium priority, but it is important to note that qualitative data obtained from researcher comments indicate that the interpersonal element of the working relationship should not be ignored. Further development of the *empathy* dimension will require improvement initiatives to address the topics of “understanding the specific needs of their researchers” and “having their researcher’s best interests at heart.”

#### Tangibles - Priority rank: 5

The *tangibles* dimension encompasses physical facilities, equipment, personnel, and communication materials. This dimension obtained the smallest positive gaps for Post-Award Division, in items related to having a welcoming environment, modern looking equipment, and visually-appealing materials. However, all three of these items still have a large positive gap score threshold for “critical” designation. The smallest positive gap for the entire unit, was “employees are neat in their appearance” (0.239). All items were ranked as the lowest priority for investigators, and scored below the median gap score for Post-Award, indicating that initiatives targeting these factors will have low or limited impact on service quality perception.



Table 9: Post-Award -Item Expectation, Perception, Gap Score, and p-value by Dimension

N=88	Exp	Per	Gap	T-Value	P-Value
<b>Responsiveness</b>	Mean	Mean	Mean		
Telling researchers exactly when services will be performed	6.580	4.284	2.295	9.89	<0.001
Their employees giving prompt service to researchers.	6.727	4.318	2.409	10.47	<0.001
Their employees are always willing to help researchers.	6.739	4.670	2.068	8.88	<0.001
Their employees never being too busy to respond to researchers' requests	6.341	4.352	1.989	7.84	<0.001
<b>Reliability</b>					
Promising to do something by a certain time, and doing so	6.523	4.170	2.352	9.99	<0.001
Showing a sincere interest in solving researchers' problems.	6.648	4.557	2.091	8.75	<0.001
Performing the service right the first time	6.420	4.295	2.125	8.93	<0.001
Providing the service at the time they promise to do so	6.523	4.216	2.307	9.61	<0.001
Insisting on error-free documents	6.511	4.602	1.909	8.99	<0.001
<b>Assurance</b>					
The behavior of their employees instilling confidence in researchers	6.580	4.500	2.080	8.96	<0.001
Researchers feel confident performing transactions.	6.580	4.295	2.284	9.34	<0.001
Their employees being consistently courteous with researchers	6.625	5.250	1.375	6.62	<0.001
Their employees having the knowledge to answer researchers' questions.	6.591	4.852	1.739	8.12	<0.001
<b>Empathy</b>					
Giving researchers individual attention	6.420	4.977	1.443	7.08	<0.001
Having operating hours convenient to all their researchers	6.205	4.830	1.375	6.25	<0.001
Having employees who give researchers personal attention	6.466	5.000	1.466	7.38	<0.001
Having their researcher's best interests at heart	6.545	4.398	2.148	9.27	<0.001
Their employees understanding the specific needs of their researchers.	6.432	4.307	2.125	8.65	<0.001
<b>Tangibles</b>					
Have modern looking equipment.	5.591	4.716	0.875	5.34	<0.001
The physical environment is welcoming	5.841	4.807	1.034	5.83	<0.001
Their employees are neat in their appearance	5.830	5.591	0.239	1.59	0.115
Have user friendly materials associated with the services (web page information, documents)	6.170	4.693	1.477	7.27	<0.001

	<b>Positive Gap Score (Deficiency)</b>		<b>Significant Gap</b>
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## 6 SERVICE QUALITY AREAS BY UNIT WITH EXPECTED IMPACT OF IMPROVEMENT INITIATIVES

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Tables 10,11, and 12 consider the gap score for each item, and link them to the dimension and priority rank they belong to. These tables are provided as a reference tool for administrators and unit personnel, to allow the identification of strengths and critical areas, and assist in the prioritization of initiatives to address quality gaps.

### 6.1 PROPOSAL DEVELOPMENT UNIT

None of the items of the Proposal Development Unit (PDU) are considered a critical area for improvement. Consequently, this study organized the gap scores from smallest to largest, with the purpose of providing this unit with an internal guideline of the impact improvement efforts in these areas would have on researcher service quality perception.

If the gap score is negative, this item is considered a unit strength. The median gap score in this Unit is 0.0515. If the item's gap score falls under the median, improvement efforts targeting that area are considered to have a limited impact on service quality perception. Once an item gap score surpasses the median, its impact is projected according to the priority rank of the dimension it belongs to. A dimension with a priority rank of 5 results in a low impact classification. A priority rank of 3 or 4 receives a medium impact classification, and a priority rank of 1 or 2 is considered a high impact area.

Criteria	Classification
Gap score is Negative	Unit Strength
Gap score is under Median	Limited Impact
Dimension Priority Rank is 5	Low Impact
Dimension Priority Rank is 3 or 4	Medium Impact
Dimension Priority Rank is 1 or 2	High Impact

Table 10: Impact Classification Criteria for Proposal Development Unit Initiatives

Priority	Dimension	Item	Gap Score	Initiative Impact
5	<i>Tangibles</i>	Have modern looking equipment.	-0.345	Unit Strength
4	<i>Empathy</i>	Having operating hours convenient to all their researchers	-0.207	Unit Strength
2	<i>Responsiveness</i>	Their employees never being too busy to respond to researchers' requests	-0.172	Unit Strength
4	<i>Empathy</i>	Giving researchers individual attention	-0.138	Unit Strength
4	<i>Empathy</i>	Having employees who give researchers personal attention	-0.138	Unit Strength
3	<i>Assurance</i>	Their employees being consistently courteous with researchers	-0.103	Unit Strength
2	<i>Responsiveness</i>	Their employees are always willing to help researchers.	-0.034	Unit Strength
1	<i>Reliability</i>	Performing the service right the first time	-0.034	Unit Strength
1	<i>Reliability</i>	Showing a sincere interest in solving researchers' problems.	0.034	Limited Impact
4	<i>Empathy</i>	Having their researcher's best interests at heart	0.034	Limited Impact
5	<i>Tangibles</i>	The physical environment is welcoming	0.034	Limited Impact
5	<i>Tangibles</i>	Their employees are neat in their appearance	0.034	Limited Impact
		Median = 0.0515		
1	<i>Reliability</i>	Insisting on error-free documents	0.069	High Impact
3	<i>Assurance</i>	Their employees having the knowledge to answer researchers' questions.	0.069	Medium Impact
5	<i>Tangibles</i>	Materials associated with the (pamphlets or statements) are visually appealing	0.103	Low Impact
3	<i>Assurance</i>	Researchers feeling safe in their proposal design decisions.	0.138	Medium Impact
2	<i>Responsiveness</i>	Their employees giving prompt service to researchers.	0.172	High Impact
4	<i>Empathy</i>	Their employees understanding the specific needs of their researchers.	0.172	Medium Impact
5	<i>Tangibles</i>	The physical facilities are responsive to investigator's workspace needs.	0.172	Low Impact
5	<i>Tangibles</i>	The physical facilities are conducive to productive work.	0.172	Low Impact
3	<i>Assurance</i>	The behavior of their employees instilling confidence in researchers	0.1724	Medium Impact
1	<i>Reliability</i>	Providing the service at the time they promise to do so	0.241	High Impact
1	<i>Reliability</i>	Promising to do something by a certain time, and doing so	0.276	High Impact
2	<i>Responsiveness</i>	Telling researchers exactly when services will be performed	0.379	High Impact

## 6.2 PROPOSAL SUBMISSION UNIT

None of the items of the Proposal Submission Unit are considered a critical area for improvement. Consequently, this study organized the gap scores from smallest to largest, with the purpose of providing this unit with an internal guideline of the impact improvement efforts in these areas would have on researcher service quality perception.

If the gap score is negative, the item is considered a unit strength. The median gap score in this Unit is 0.2119. If the item's gap score falls under the median, improvement efforts targeting that area are considered to have a limited impact on service quality perception. Once an item gap score surpasses the median, its impact is projected according to the priority rank of the dimension it belongs to. A dimension with a priority rank of 5 results in a low impact classification. A priority rank of 3 or 4 receives a medium impact classification, and a priority rank of 1 or 2 is considered a high impact area.

Criteria	Classification
Gap score is Negative	Unit Strength
Gap score is under Median	Limited Impact
Dimension Priority Rank is 5	Low Impact
Dimension Priority Rank is 3 or 4	Medium Impact
Dimension Priority Rank is 1 or 2	High Impact

Table 11: Impact Classification Criteria for Proposal Submission Unit Initiatives

Priority	Dimension	Item	Gap Score	Impact
5	<i>Tangibles</i>	Their employees are neat in their appearance	-0.353	Unit Strength
4	<i>Empathy</i>	Having employees who give researchers personal attention	-0.071	Unit Strength
4	<i>Empathy</i>	Giving researchers individual attention	0.0118	Limited Impact
3	<i>Assurance</i>	Their employees being consistently courteous with researchers	0.0235	Limited Impact
1	<i>Responsiveness</i>	Their employees are always willing to help researchers.	0.0824	Limited Impact
4	<i>Empathy</i>	Having their researcher`s best interests at heart	0.1059	Limited Impact
1	<i>Responsiveness</i>	Their employees never being too busy to respond to researchers` requests	0.165	Limited Impact
2	<i>Reliability</i>	Performing the service right the first time	0.176	Limited Impact
3	<i>Assurance</i>	Their employees having the knowledge to answer researchers` questions.	0.1882	Limited Impact
2	<i>Reliability</i>	Showing a sincere interest in solving researchers` problems.	0.2118	Limited Impact
3	<i>Assurance</i>	The behavior of their employees instilling confidence in researchers	0.2118	Limited Impact
3	<i>Assurance</i>	Researchers feeling safe in their proposal design decisions.	0.2118	Limited Impact
		Median=0.2119		
1	<i>Responsiveness</i>	Telling researchers exactly when services will be performed	0.212	High Impact
4	<i>Empathy</i>	Having operating hours convenient to all their researchers	0.224	Medium Impact
4	<i>Empathy</i>	Their employees understanding the specific needs of their researchers.	0.224	Medium Impact
2	<i>Reliability</i>	Insisting on error-free documents	0.2353	High Impact
1	<i>Responsiveness</i>	Their employees giving prompt service to researchers.	0.247	High Impact
5	<i>Tangibles</i>	Materials associated with the (pamphlets or statements) are visually appealing	0.259	Low Impact
2	<i>Reliability</i>	Providing the service at the time they promise to do so	0.306	High Impact
5	<i>Tangibles</i>	Have modern looking equipment.	0.318	Low Impact
2	<i>Reliability</i>	Promising to do something by a certain time, and doing so	0.4118	High Impact
5	<i>Tangibles</i>	The physical facilities are responsive to investigator`s workspace needs.	0.435	Low Impact
5	<i>Tangibles</i>	The physical environment is welcoming	0.529	Low Impact
5	<i>Tangibles</i>	The physical facilities are conducive to productive work.	0.682	Low Impact

### 6.3 POST-AWARD DIVISION

All except one of the items for the Post-Award Division are considered critical improvement areas. For items deemed critical, the impact that improvement initiatives will have on the perceived quality of the service is determined by their corresponding priority rank and gap score size.

The Post-Award median gap score was 2.02. If an item's gap score falls under the median, its impact level is determined by the dimension's rank according to researcher priorities. If the item belongs to a dimension with a priority rank of 5, improvement initiatives will have a Low impact in the service quality perceived by the researchers. If it has a priority rank of 3 or 4, it will have a Medium impact, and an item with a priority rank of 1 or 2 will have a High impact. If an item's gap score exceeds the median value for the unit, improvement efforts corresponding to those items increase one impact level in their classification due to the size of the quality gap.

Criteria	Classification
Dimension Priority Rank is 5	Low Impact
Dimension Priority Rank is 3 or 4	Medium Impact
Dimension Priority Rank is 1 or 2	High Impact
Gap score over Median	Increase one impact level

Table 12: Impact Classification Criteria for Post-Award Division Initiatives

Priority	Dimension	Item	Gap Score	Impact
5	Tangibles	Their employees are neat in their appearance	0.239	Low Impact
5	Tangibles	Have modern looking equipment.	0.875	Low Impact
5	Tangibles	The physical environment is welcoming	1.034	Low Impact
3	Assurance	Their employees being consistently courteous with researchers	1.375	Medium Impact
4	Empathy	Having operating hours convenient to all their researchers	1.375	Medium Impact
4	Empathy	Giving researchers individual attention	1.443	Medium Impact
4	Empathy	Having employees who give researchers personal attention	1.466	Medium Impact
5	Tangibles	Have user friendly materials associated with the services (web page information, documents)	1.477	Low Impact
3	Assurance	Their employees having the knowledge to answer researchers' questions.	1.739	Medium Impact
1	Reliability	Insisting on error-free documents	1.909	High Impact
2	Responsiveness	Their employees never being too busy to respond to researchers' requests	1.989	High Impact
		Median = 2.02		
2	Responsiveness	Their employees are always willing to help researchers.	2.068	High Impact
3	Assurance	The behavior of their employees instilling confidence in researchers	2.08	High Impact
1	Reliability	Showing a sincere interest in solving researchers' problems.	2.091	High Impact
4	Empathy	Their employees understanding the specific needs of their researchers.	2.125	High Impact
1	Reliability	Performing the service right the first time	2.125	High Impact
4	Empathy	Having their researcher's best interests at heart	2.148	High Impact
3	Assurance	Researchers feel confident performing transactions.	2.284	High Impact
2	Responsiveness	Telling researchers exactly when services will be performed	2.295	High Impact
1	Reliability	Providing the service at the time they promise to do so	2.307	High Impact
1	Reliability	Promising to do something by a certain time, and doing so	2.352	High Impact
2	Responsiveness	Their employees giving prompt service to researchers.	2.409	High Impact

## 7 ITEM COMPARISON BY DIMENSION (ALL SERVICE UNITS)

This section provides visualizations to assist R&D Center administrators in identifying patterns, evaluating priorities and assigning resources. Individual item Gap scores for all three units were plotted in a line chart and grouped by dimension. The results are presented in Figures 7 through 11.

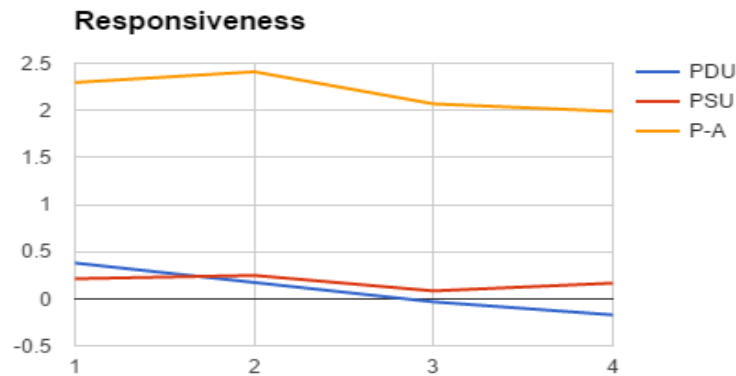


Figure 7: Responsiveness Dimension: Service Unit Comparison by Item

Table 13: Responsiveness Dimension: Service Unit Comparison by Item

Responsiveness	Items	PDU	PSU	P-A
Telling researchers exactly when services will be performed	1	0.379	0.212	2.295
Their employees giving prompt service to researchers.	2	0.172	0.247	2.409
Their employees are always willing to help researchers.	3	-0.034	0.0824	2.068
Their employees never being too busy to respond to researchers' requests	4	-0.172	0.165	1.989

For the *responsiveness* dimension, unit gap scores for the first two items were consistently the highest. In varying degrees, resources should be dedicated across all service units to matters pertaining to prompt service and communication about scheduled work. Implementing a request-tracking system will allow offices to collect the internal data (lead time, process time, wait time) necessary to make adjustments and process optimizations to improve *responsiveness*.



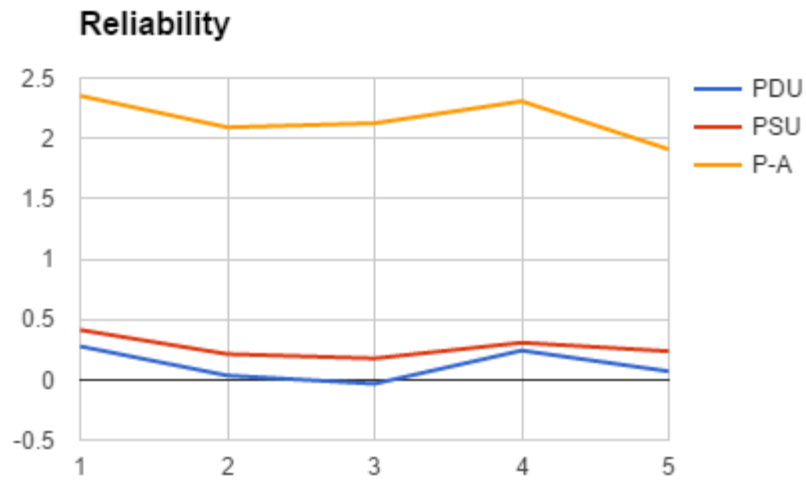


Figure 8: Reliability dimension: service unit comparison by item

Table 14: Reliability Dimension: Service Unit Comparison by Item

Reliability	Items	PDU	PSU	P-A
Promising to do something by a certain time, and doing so	1	0.276	0.4118	2.352
Showing a sincere interest in solving researchers' problems.	2	0.034	0.2118	2.091
Performing the service right the first time	3	-0.034	0.176	2.125
Providing the service at the time they promise to do so	4	0.241	0.306	2.307
Insisting on error-free documents	5	0.069	0.2353	1.909

For the *reliability* dimension, unit gap scores for items 2 and 4 were consistently the highest. These items measure researcher perception about the temporal aspect of *reliability*. This pattern is indicative of a need across all units of greater certainty in regards to when a service or task will be completed. Initiatives to schedule, assign, and follow up on foreseeable tasks should be undertaken to provide a greater sense of certainty to investigators requesting services from the R&D Center. As with *responsiveness*, implementing a request-tracking system can provide the internal metrics needed for continuous improvement in this area. It might also be necessary to evaluate workload and staffing levels to increase *reliability* in all units.

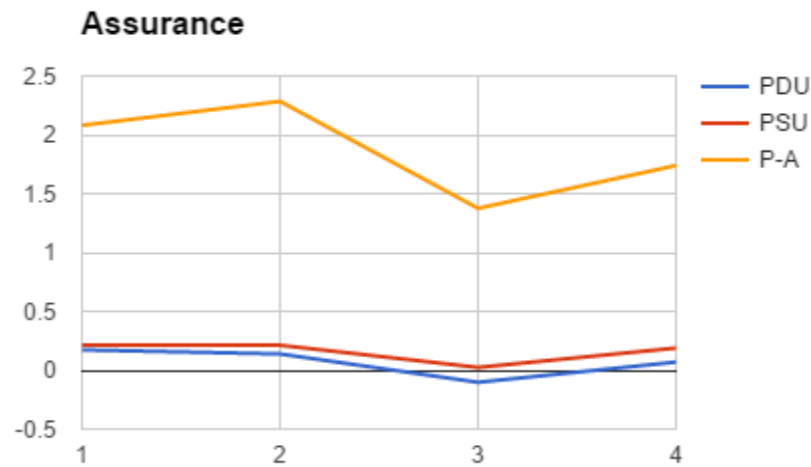


Figure 9: Assurance Dimension: Service Unit Comparison by Item

Table 15: Assurance Dimension: Service Unit Comparison by Item

Assurance	Items	PDU	PSU	P-A
The behavior of their employees instilling confidence in researchers	1	0.1724	0.2118	2.08
Researchers feeling safe in their proposal design decisions / Researchers feel confident performing transactions.	2	0.138	0.2118	2.284
Their employees being consistently courteous with researchers	3	-0.103	0.0235	1.375
Their employees having the knowledge to answer researchers' questions.	4	0.069	0.1882	1.739

For the *assurance* dimension, unit gap scores for the first two items were consistently the highest. These items measure researcher perception about trust and confidence during their service transactions. While a degree of uncertainty is to be expected when requesting external funds for research, a reduction in these gap scores did not occur as the evaluation shifted to Post-Award's internal processes and compliance requirements. The data suggests that projects should be undertaken to improve researcher confidence, especially in Post-Award transactions. This might take the form of increased communication and process transparency, and/or a greater focus on explaining processes and more closely guiding researchers through their completion.

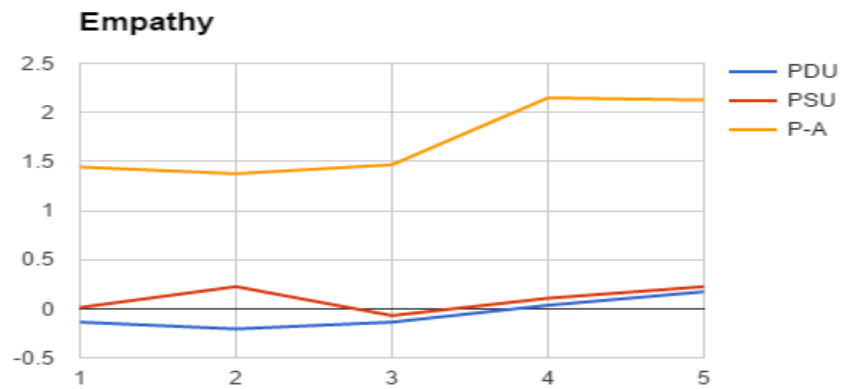


Figure 10: Empathy Dimension: Service Unit Comparison by Item

Table 16: Empathy Dimension: Service Unit Comparison by Item

Empathy	Items	PDU	PSU	P-A
Giving researchers individual attention	1	-0.138	0.0118	1.443
Having operating hours convenient to all their researchers	2	-0.207	0.224	1.375
Having employees who give researchers personal attention	3	-0.138	-0.071	1.466
Having their researcher`s best interests at heart	4	0.034	0.1059	2.148
Their employees understanding the specific needs of their researchers.	5	0.172	0.224	2.125

For the *empathy* dimension, item 5 almost universally presented the highest gap score. This is indicative of investigators placing a high value on staff understanding their specific needs, and presents an opportunity for staff professional development to lay the groundwork for improvements in this area. Further progress could require additional process and regulatory changes, as their nature might require them to be balanced against researcher needs. Item 4 was a strength for Pre-Award units, but presented the highest quality gap for Post-Award. Additional initiatives should focus on developing communication and understanding between Post-Award staff and investigators, to increase the perception that the staff has their best interests at heart. Item 2, pertaining to operating hours, was a pattern outlier for the PSU. Its gap size suggests that a minority of researchers expect more availability of staff outside regular working hours. Further research into investigator needs and expectations regarding PSU services in this area is necessary to understand this outlying item.

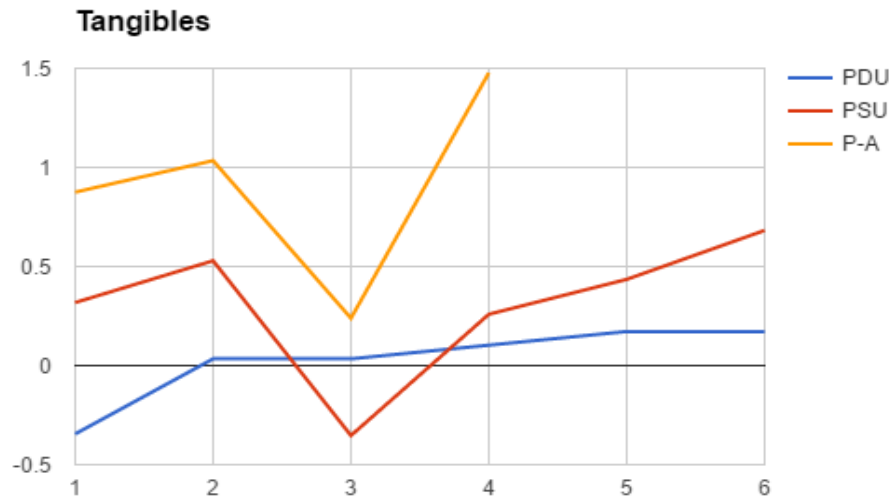


Figure 11: Tangibles Dimension: Service Unit Comparison by Item

Table 17: Tangibles Dimension: Service Unit Comparison by Item

Tangibles	Items	PDU	PSU	P-A
Have modern looking equipment.	1	-0.345	0.318	0.875
The physical environment is welcoming	2	0.034	0.529	1.034
Their employees are neat in their appearance	3	0.034	-0.353	0.239
Materials associated with the (pamphlets or statements) are visually appealing / Have user friendly materials associated with the services (web page information, documents)	4	0.103	0.259	1.477
The physical facilities are responsive to investigator`s workspace needs.	5	0.172	0.435	N/A
The physical facilities are conducive to productive work.	6	0.172	0.682	N/A

For the *tangibles* dimension, PSU and Post-Award show the exact same pattern for the first four items, with the PDU being an outlier. Item 2, pertaining to a welcoming environment, shows a markedly worse performance for PSU and Post-Award Division. A possible explanation for this is that these units are located in the R&D Center Administration Building, while the PDU is in a newer office in the Main Building. Item 4 was the worst performer for Post-Award, indicating that

their documents and online presence require significant improvement to match researcher expectations.

Items 5 and 6, pertaining to physical facilities, were not applicable to Post-Award. The PDU quality gap for these items was markedly lower than the PSU one, especially in regards to item 6 (facilities conducive to productive work). Qualitative data indicates that investigators are not satisfied with the physical arrangement of PSU staff cubicles, the lack of privacy they provide, their lack of space for meeting with multiple investigators, and the reduced space of the waiting area. These problems could be addressed by unifying Pre-Award offices in the PDU physical space, providing PSU staff with space they can use in the PDU office, or by the PSU making more extensive use of the PDU meeting room to address researcher privacy and space concerns.

## 8 QUALITATIVE DATA

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Researchers had the opportunity to express their suggestion through an open question: “Do you have any suggestions to improve the services at the Research & Development Center of the UPRM?”. Their answers were collected and analyzed manually, classifying each comment into one of three corpora: PDU, PSU, or Post-Award. Word frequency and associations within these categories were explored via the Voyant Tools text analysis environment. The most frequently-utilized terms were identified, and word link visualizations were created. These links were verified via the text mining library in RStudio. Low-frequency terms, which can be more informative due to their specificity, were also examined to contextualize the analysis. A final close reading of the texts was carried out to ensure accuracy.

### 8.1 PRE-AWARD RESEARCHER COMMENTS

In general, researchers affirmed that the employees who work at the Proposal Development Unit (PDU) and Proposal Submission Unit (PSU) are competent, respectful, and polite. They are considered easy to work with, and have a commendable commitment to their work. Their attitude towards researchers is praised as an example of a standard for the rest of the R&D Center. Researchers remark that Pre-Award staff provide fast and correct responses to their questions, and are willing to seek out answers to assist the researcher. Comments about the PDU and PSU frequently remarked on their excellence, and they can be said to offer a competitive service. The two offices were mentioned as some of the best at the UPRM campus. Researchers praised the units’ current efforts to use technology to facilitate grant submission-related processes. In particular, it was mentioned that PSU staff does a commendable job in handling and submitting on time the large number of proposals they process with only three employees. Their efforts were said to make working with difficult proposal submission systems “as painless as possible” for

researchers. Some researchers affirmed that their experience working with Pre-Award is markedly different from their Post-Award interactions, and that the Pre-Award office is engaged in continuous improvement over time.

The ten most frequent words in the PDU corpus, as indicated in Voyant Tools' Corpus Terms tool, are shown in Table 18.

Table 18: Most Frequent Words in the PDU corpus

Word	Frequency
PDU	6
Research	6
Pre-award	5
PSU	5
Excellent	4
Work	4
Funding	3
Offices	3
Personnel	3
UPRM	3

Less frequent keywords (selected for context) were: commended, commitment, and competent. Figure 12 shows the words most commonly linked to the three most frequent terms.



Figure 12: PDU Corpus Word Link

The word “PDU” shows a strong association with “PSU,” and a lesser (but still significant) association with the word “excellent.” Figure 13 highlights these word links.

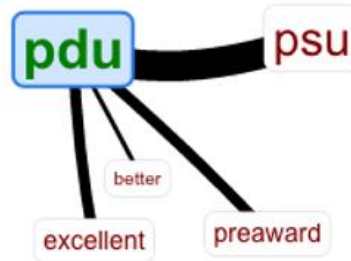


Figure 13: Keyword Links: PDU

Table 19 shows the ten most frequent words in the PSU corpus:

Table 19: Most Frequent Words in the PSU corpus

Word	Frequency
PSU	13
Pre-award	8
Personnel	7
Researchers	7
Work	7
CID	6
Excellent	6
Time	6
PDU	5
Best	4

Less frequent keywords (selected for context) were: cubicles, overworked, overwhelmed, competent, and commended. Figure 14 shows the words most commonly linked to the three most frequent terms in the PSU corpus.





Figure 14: PSU Corpus Word Link

The words most frequently associated with PSU were “PDU,” “excellent,” “best,” and “limited” (in the sense of “limited resources”), shown in Figure 15.



Figure 15: Keyword Links: PSU

## 8.2 PRE-AWARD IMPROVEMENTS SUGGESTED BY RESEARCHERS

Some researchers provided suggestions and ideas for improvement. These are summarized per division in the sections that follow.

### **8.2.1 Proposal Development Unit**

- Increase the number of employees as an investment to obtain more external funds for research and education.
- Continue expanding its efforts to diversify UPRM funding sources, targeting investigators' specific interests.
- Facilitate the work of the Principal Investigator so they can concentrate on the bulk of the proposal, without having to worry about "aesthetic details."
- The addition of a "research development" role to the PDU, or the creation of a new office, "to deal with the big picture of research at UPRM." This role would involve collaborating with researchers, associate deans, and other interested parties to formulate strategic plans aimed at improving the research culture at UPRM.
- Promote activities between colleges to meet and share ideas to solve common problems.

### **8.2.2 Proposal Submission Unit**

- Many researchers insisted that more PSU employees are needed. Though the general opinion was that the office provides great service "despite being overworked", some remarks suggested that additional staff will reduce the possibility of mistakes caused by an excessive workload.
- There was a strong insistence among survey participants about the need for upgraded physical facilities for the PSU. Suggestions included:
  - More appropriate seating areas for investigators working with the PSU.
  - A "work area" for researchers preparing their proposals.
  - Changing the office layout, as the current cubicles are uncomfortable and, in the researchers' opinion, hinder productivity.

- Addressing privacy and space constraints at the PSU office; researchers feel they are not at liberty to discuss sensitive information, and it is difficult for more than one investigator at a time to meet with PSU staff due to the room layout.
- One researcher asked the PSU to consider ways to facilitate a more efficient use of time and of the Kuali Coeus platform for researchers who seldom submit proposals, such as having all work done by the R&D Center instead of teaching researchers to use the platform.
- Developing guidelines to help researchers understand and anticipate the impact of indirect costs on their budget.
- Preparing templates of general forms, such as an NIH and/or NSF budget, and making them available online.

### **8.3 POST-AWARD RESEARCHER COMMENTS**

Researchers recognize that these offices “do an impressive job with very limited resources,” but also expressed that award management is complicated by their interactions with Post-Award staff. Opinions on employee performance are divided; some employees are perceived to be “diligent, helpful, and a pleasure to work with” while others are perceived to give the unit a negative reputation. Overall, unit performance is not perceived as aligned to the level of an institution with UPRM’s amount of research activity. Qualitative comments emphasize that improvements are needed in terms of *responsiveness*, *reliability*, *empathy*, and processes.

The ten most frequent words in the Post-Award Division corpus, per Voyant Tools’ Corpus Terms tool, are identified in Table 20.

Table 20: Most Frequent Words in the Post-Award Division corpus

Word	Frequency
CID	30
Researchers	24
Post-award	22
Research	18
Improve	16
Needs	16
Time	15
Purchasing	14
Understand	12
Employees	11

Less frequent keywords (selected for context) were: paperwork, attitude, auditors, competent, inefficiency, and invoicing.

Researcher comments on their interactions with employees highlight a problem of overwork and lack of motivation among staff, and emphasize that they do not feel their needs are understood or prioritized. Research efforts are hindered by a lack of *responsiveness* (such as emails being left unanswered, no notifications being sent out when there are problems with paperwork, and service requests being queued for months) that results in employees being perceived as too busy to be able to help them. In terms of *empathy*, investigators feel they are not being treated as clients, and that interactions with Post-Award staff obstruct rather than facilitate research at UPRM. Many researchers request better communication, greater consistency among different employees' interpretation of applicable regulations, more flexibility when mistakes are made, and greater courtesy in employee-researcher interactions.

Investigators' comments signal their perception that Post-Award functions at the R&D Center need to shift from an audit-focused approach to a service-focused perspective when managing requests. The perception of current policies and processes is that they undermine the relationship of trust necessary between the R&D Center and its researchers. Additionally, there is

an understanding that auditor requests are having a strong negative effect on the time and effort R&D Center staff put on their principal duties, and this in turn reduces service quality and increases the burden on investigators. One researcher noted that “forms and procedures should be there to help get to the goal; forms and procedures should never be the goals.”

A recurring subject in the comments received was the need to improve intra-office and inter-office communication, with the purpose of increasing efficiency and avoiding the need for duplicate paperwork in the case of documents that have already been filed at the R&D Center. Additionally, improving internal communication and collaboration would allow offices to provide a consensus opinion to researchers about the applicable interpretation of norms and regulations.

Figure 16 shows the most frequent words linked to the top three terms in the Post-Award corpus.



Figure 16: Post-Award Corpus Word Link

Due to the larger size of the Post-Award corpus, additional visualizations were prepared to illustrate individual keyword correlations. The results are presented in Figures 17 through 21.

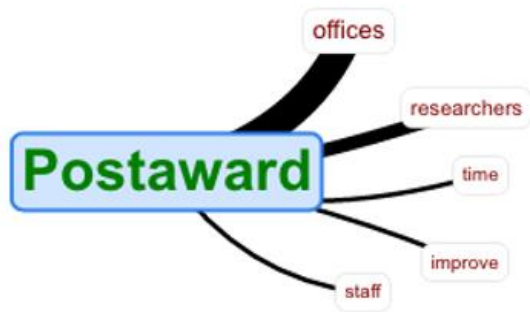


Figure 17: Keyword Links: Post- Award



Figure 18: Keyword Links: Accounting



Figure 19: Keyword Links: Time



Figure 20: Keyword Links: Improve

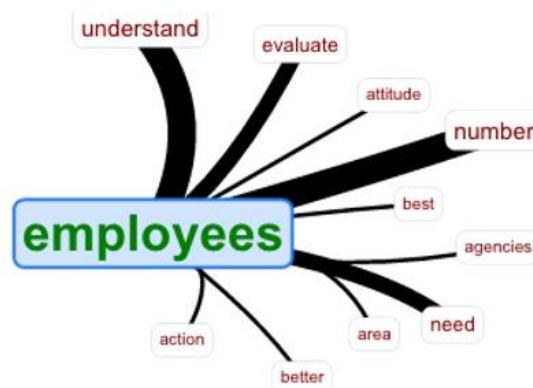


Figure 21: Keyword Links: Employees

Some researchers provided general improvement suggestions for Post-Award, while others mentioned specific offices and processes that require attention. These are summarized as follows:

#### **8.4 GENERAL POST-AWARD IMPROVEMENTS SUGGESTED BY RESEARCHERS**

- Many investigators suggested that Post-Award Division should improve their response times and process times. Their perception is that some Post-Award offices are understaffed. More staff and better equipment/software are needed to effectively manage the amount of work processed by the R&D Center.
- Post-Award staff should see themselves as facilitators, and adopt a congruous approach when interacting with researchers to help them reach their research goals.
- Post-Award staff duties should allow for redundancy and reassigning of service requests, in case an employee must be away from the office for an extended period of time.
- Post-Award offices should cultivate a culture that values and seeks increased process efficiency. A positive attitude and enthusiasm for assisting researchers should be fostered.
- Employees should adopt a proactive approach to research administration, and engage in continuous communication with the researcher instead of waiting for their requests to reach them.
- Increase accountability by engaging in constant formal and informal evaluation of staff, and provide adequate incentives to motivate employees and improve performance.
- Post-Award Division interactions with researchers should reflect a customer service model and attitude. Various researchers mentioned that the R&D Center exists to support research, which they understand to mean it should encourage and enable their efforts while maintaining compliance with sponsor agency standards. This would allow them to grow professionally and in turn bring more funds to the institution.

- The R&D Center should increase awareness among Post-Award staff about the important contribution their work represents to the success of UPRM research projects, the university, and the island of Puerto Rico. To build trust and cultivate *empathy* with their clients, Post-Award staff should communicate their knowledge and awareness of the value of UPRM research projects when engaging investigators.
- Numerous researchers mentioned they had negative experiences when corroborating account balances against their own spending records. This issue seems to stem from significant delays between when money was spent and when these changes are reflected in their accounts. Researchers' ideal expectations of accounting records include real-time updates and periodic notifications of balances and other related information.
- One researcher suggested focusing resources on information management, including:
  - “Collecting and gathering complete and accurate data
  - Data storage and retrieval
  - Sharing information with other offices and units (eliminating continuous duplication and redundancies)
  - Generating reports.”
- A researcher pointed out that Post-Award offices should adjust their processes to “protect and attend the needs of the most vulnerable sector of the university community: the graduate students and particularly the international students (non-US citizens).”

## **8.5 IMPROVEMENTS TO SPECIFIC POST-AWARD OFFICES SUGGESTED BY RESEARCHERS**

This section presents some suggestions for improving the performance of this division, given the apparent dissatisfaction shown by its clients.



### **8.5.1 Accounting & Finance**

- This unit was highlighted among Post-Award offices as having a need for more personnel (due to the detail-oriented nature of their work) and training. Accounting & Finance should take steps to develop employee skills, build commitment to enabling research, and improve professional attitudes. In turn, there should be improvements to staff working conditions, providing them the right tools and technology to allow them to carry out their duties effectively.
- The most frequently repeated suggestion pertained to the sponsor invoicing process (recovering funds that the university has already spent). Researchers strongly feel that the Accounting & Finance office takes too long to complete this process, which has negative consequences for UPRM and affects its image with sponsors, lowering the likelihood of future funding from the agency.
  - Researcher comments suggest there should be increased accountability regarding sponsor invoicing to address the perception that UPRM is losing money due to slow and/or unfinished invoicing actions.
  - Spending reports and invoices should be sent more frequently to Federal agencies and private companies, to avoid sponsor inquiries about lack of spending in grants that are utilizing their funds as scheduled.
  - Accordingly, researchers suggest an increase in the number of Post-Award staff to ensure timely invoicing.
- Other Post-Award processes at the R&D Center were highlighted in investigator comments due to failing to meet expectations of prompt service. Process improvement initiatives

targeting these processes would improve investigators' perception of service quality in

Accounting & Finance:

- Prompt payments to participants, suppliers, and service providers
  - Faster processing of reimbursements to investigators
  - Faster processing of travel closeouts
  - Improve electronic access to the current financial status of researchers' grants
  - Faster logging of transactions in the UPRM finance system, making these records useful to researchers
- Investigators feel that there is an inordinate amount of emphasis on audit-proofing the services they receive from the Accounting & Finance office. Instead, they suggest developing and implementing an annual R&D Center internal audit process that is less onerous and time-consuming for Accounting & Finance staff and for investigators, based on best practices for similar institutions in the United States.
- AMEX-related processes were highlighted as a problematic area. Comments suggest that:
  - Processes and regulations must be applied consistently among employees, while allowing greater flexibility when investigators make mistakes in their paperwork.
  - There is a perception that staff takes "punitive" actions in response to investigator mistakes.
- It should be noted that there is a perception among some researchers that employees intentionally avoid processing their requests, leaving documents stuck in a backlog without informing the requester until the researchers inquire why a payment or purchase order has been delayed.

### **8.5.2 Budget**

- The only specific suggestions provided for the budget office were:
  - Reducing errors
  - Process time for account generation should be reduced.
- The Budget office was mentioned along with Accounting & Finance and Purchasing as requiring improvements.
  - In this context, focusing this office's efforts on increased collaboration, cooperation, and data sharing with other R&D Center offices would reduce duplicate requests for documents.

### **8.5.3 Purchasing**

- Provide updated process checklists to help researchers utilize the Purchasing office's services.
- Overhaul the purchasing system and processes to increase accuracy, speed, and efficiency, and to improve communication with researchers by:
  - Significantly reducing process times for completing purchase orders
  - Reducing errors
- One researcher communicated the perception that purchasing processes are punitive when an investigator makes a mistake.

## **8.6 R&D CENTER RESEARCHER COMMENTS**

Some researchers opted to present suggestions about the R&D Center in general, or about matters that fall within the purview of the Director's Office. Opinion among researchers is split between recognizing that R&D Center offices "do an impressive job with very limited resources"

and criticism of attitudinal and motivational factors affecting staff performance in some service areas.

### **8.7 OFFICE OF THE DIRECTOR RESEARCHER COMMENTS**

The support provided by the receptionist/executive secretary/legal secretary (Ms. Janellis Valle Ma, at the time the survey was distributed) was considered excellent. She was highlighted as a skilled multi-tasker possessing extensive knowledge of the R&D Center's inner workings and a deep understanding of researchers' needs, and providing quick and accurate responses to their requests.

### **8.8 R&D CENTER IMPROVEMENTS SUGGESTED BY RESEARCHERS**

- Increase the number of employees across all R&D Center units.
  - One researcher suggested that staff from other campus units should be temporarily reassigned to the R&D Center.
- Increased staffing and involvement of legal counsel in R&D Center operations to communicate that they hold the best interests of the researchers and their projects at heart. Focus on increasing legal knowledge specifically pertinent to sponsored research.
- Argue that auditors should adjust their evaluations to the realities of sponsored research rather than applying general standards out of context.
- Make improvements to the R&D Center website, to have information and documentation that is clear and easy to find.
- Make staffing arrangements to provide flexible office hours in all units.
- Increased maintenance to facilities
- Take a leading role in increasing interdisciplinary collaboration at UPRM.

- Improve communication between research administrators and researchers.
- Provide workshops focused on Pre- and Post-Award procedures, rather than general information.
- Allow researchers to access and track the progress of their R&D Center service processes online.
- Change the R&D Center Advisory Board to be exclusively composed of researchers, based on their years of experience. Provide some representatives for new faculty.
- Send monthly emails publicizing new contracts and grants obtained by UPRM researchers (PI's, project title, department, amount, agency, etc.).
- Have the R&D Center provide ethics oversight and policing by:
  - Not allowing corporate credit cards to be used for private expenses.
  - Watching for embezzlement in the use of money allocated for specific purposes
  - Prosecuting researchers that embezzle research funds and plagiarize research articles, manuscripts, books and research proposals.
  - Audit researchers with extensive release time for research and/or administration purposes.
- Focus on providing support instead of making rules or installing new policies

## 9 CONCLUSIONS

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This study achieved its principal objective: addressing the identified gaps in knowledge and obtaining results that are of benefit to the research administration profession both locally and internationally. The principal achievement was the development of an adapted SERVQUAL instrument that can support continuous improvement efforts at Research Administration Centers through the assessment and evaluation of service quality levels. This instrument can be used to establish standard metrics that are comparable across institutions, facilitating and promoting the sharing of information and subsequent comparative analysis. The conclusions of the study and the applicability of the SERVQUAL instrument to research administration are based on the case study of the UPRM Research & Development Center (R&DC). Its clients completed the questionnaire to evaluate the perceived service quality of the three units under study: the Proposal Development Unit (PDU), the Proposal Submission Unit (PSU), and the Post-Award Division (Accounting & Finance, Budget, Purchasing, and Human Resources offices). The data collected for this study provides evidence of the fundamental role played by the R&D Center in safeguarding, strengthening, and promoting research at UPRM. The importance of this role serves to highlight the necessity of offering high-quality services that allow the Center and its investigators to maximize research productivity.

The specific objectives of this research project were also attained. Through the case study, key information was obtained about the UPRM investigators' priorities and both the R&D Center's strengths and its critical areas for improvement were identified. This information was summarized in table format, and can form the basis for planning future initiatives to leverage strengths or address shortcomings. In all units, investigators prioritized the dimensions of *responsiveness* and *reliability* over all other aspects of service quality, making these the most important aspects clients

are looking for in a high-quality Research Administration Center. The least-important dimension according to the quantitative data obtained was *tangibles*, but it must be emphasized that qualitative data often indicated that it still affects investigators' perception of the Center.

Results for the PDU and the PSU show there are small gaps between researcher expectations and perceptions, with some areas exceeding expectations. This indicates a high overall level of service quality. The items where the PDU most exceeded expectations were "having modern-looking equipment" and "having operating hours convenient to all researchers" with a gap score of -0.345 and -0.207, respectively. The largest gaps in service quality for the PDU were:

- Promising to do something by a certain time, and doing so (0.276).
- Telling researchers exactly when services will be performed (0.379).

The perception score for these two items was close enough to expectations that they are not considered critical areas for improvement. Minor adjustments to PDU workflow and communication may address these areas.

The PSU exceeded expectations in the items pertaining to employee neatness (-0.353) and providing researchers with personal attention (-0.071), indicating that interactions with this office's personnel benefit from the staff's strong interpersonal skills and empathy. The lowest-performing items for the PSU were related to physical facilities, which were not considered to be welcoming or conducive to productive work. The adjustments that would have the highest impact on the perception of PSU's service quality are:

- Providing the service at the time they promise to do so (0.306).

- Promising to do something by a certain time, and doing so (0.4118).

Like the PDU, these gaps in service quality were close enough to expectations that they are not considered critical areas for improvement.

In Post-Award service quality evaluations, the large differences between expectations and perception scores indicate there is significant room for improvement in these offices. Due to the large gaps in service quality encountered, almost all areas of Post-Award services were deemed in critical need of improvement. The most high-impact improvements that could be made by Post-Award Division are:

- Telling researchers exactly when services will be performed (2.295).
- Providing the service at the time they promise to do so (2.307).
- Promising to do something by a certain time, and doing so (2.352).
- Employees giving prompt service to researchers (2.409).

One finding is that there is a need across all units of providing greater certainty in regards to when a service or task will be completed. However, there are significant differences in the perceived quality of service between Pre-Award and Post-Award. Pre-Award units exhibit, in general, high service quality levels and low gap scores. Researchers are largely satisfied with staff performance and their service-focused attitude. Many shared positive comments about the services received, and some remarked that their quality compared favorably with the rest of the UPRM campus offices. Post-Award service quality evaluations were highly critical of the time taken to perform services, duplicative paperwork requirements, and the focus on audits instead of facilitating research. Findings also point to a perceived lack of communication and trust during



service interactions between researchers and Post-Award staff. Recommendations discussed include:

- Dedicating resources across all service units to matters pertaining to prompt service and communication about scheduled work.
- Optimizing processes and collecting relevant service metrics. Implementing a request-tracking system will allow offices to collect the internal data (lead time, process time, wait time) necessary to make workflow adjustments and process changes to improve *responsiveness*.
- Developing human resources through investment in training:
  - For R&D Center staff, building knowledge about processes, improvements, and common problems, and ensuring this knowledge is successfully shared and acted upon within the organization.
  - For researchers, providing documents, templates, and tutorials that will help them navigate internal and external processes, and reduce the time it takes to complete proposal-related or project administration tasks.

The case study provided an excellent opportunity to examine the SERVQUAL instrument's strengths and weaknesses, and researchers' interactions with it, resulting in several recommendations to facilitate its continued use. Among the key concerns is the time it takes investigators to complete the questionnaire; while SERVQUAL provides a wealth of valuable data about expectations and perceptions, evaluating multiple offices at the same time can drastically multiply the time it takes to provide all the required information. In the future, it could be feasible to alternate the use of SERVQUAL and a shorter instrument that only presents the perceived

quality portion. This could be done in four-year cycles to ensure the expectation data is periodically updated. A decrease in length can also help increase the response rate, which is another concern

As observed in the literature, response rate is always a challenge in this type of research. However, this study has demonstrated that it is possible to achieve relatively high levels of participation. It takes time, perseverance, careful monitoring during the response window, and the collaboration of university personnel and administrators. During the time that the questionnaire is receiving responses, ensuring a high participation must be one of the main duties of the researcher or assigned staff. While this may seem a significant investment for offices that are usually said to be understaffed, administrators must understand that the data obtained through the instrument is a crucial asset for Research Administration Centers. As such, a business decision must be made about how much they are willing to invest in obtaining it. The case study shows that the data obtained adds significant value to service improvement efforts; to maximize this value, constant follow-up during the response window is essential.

## **9.1 FUTURE AVENUES FOR RESEARCH**

Over the course of this study, various possibilities for future research were identified:

1. Conducting a longitudinal case study over several years, using the modified SERVQUAL to monitor changes and fluctuations over time. This data should be contextualized in the case study by noting the measures taken by administrators to improve services or in response to budget constraints.
2. Identify ways in which the existing Research Administration SERVQUAL instrument could be shortened, develop the shorter instrument, and validate its results in comparison with the long-form questionnaire.

3. Increase data specificity by carrying out a service quality evaluation of individual Post-Award offices, using the general Post-Award data presented in this study to compare and identify performance differences.
4. Examine service quality results considering other data and metrics, such as organizational culture and individual services' lead, process, and wait times.

## **9.2 LIMITATIONS**

This study was conducted under some limitations that were identified and addressed through its methodology. The main constraining factor involves participant selection: individual Post-Award offices at the Research & Development Center did not maintain easily-accessible records on investigators receiving their services. For this reason, the investigators identified in the R&D Center Quali Coeus database as being involved in research projects were contacted. Over the course of contacting investigators to follow up on the initial request, some were identified as being linked to inactive accounts and were consequently excluded from the total number of possible participants. Though it would have been preferable to ask investigators about specific Post-Award offices, the compromise solution of using general Post-Award Division records enabled important discoveries about overall service levels and the qualitative data provided researchers an opportunity to elaborate on specific situations pertinent to individual offices. The Proposal Development Unit and the Proposal Submission Unit did not have this problem, as their service records are unit-specific. In the future, as new information systems allow offices to begin maintaining individual service records, it could be worthwhile to use these instead of the general Post-Award active project data.

Another limitation involved the nature of sending a research questionnaire to a large group of potential participants. There is always an element of self-selection that might bias the sample

towards negative results, but this was counterbalanced by the extensive follow-up carried out and the reminders from R&D Center staff with positive relationships to researchers. Ultimately, the participation rate exceeded the minimum threshold established and provided a representative sample of the R&D Center's client base. Finally, it must be recognized that this research was performed as an outsider to the field of research administration, a situation that was mitigated by working closely with R&D Center staff and administrators to develop the SERVQUAL questionnaire. Additionally, over the course of the study, extensive conversations about the interpretation and implications of the data were had with relevant Center personnel to ensure a thorough and accurate analysis of the information gathered, situating it within its real-world context.

Despite these limitations, this study succeeded in developing a research instrument that facilitated collecting and presenting researchers' perceptions about the quality of service from Research Administration Center units (in this case, PDU, PSU, and Post-Award). The analysis of these perceptions in the local context demonstrates various positive aspects, while revealing areas with high potential for improvement. Beyond the local context, it provides a baseline for further research into research administration service quality. In these challenging times, it is allowing Research Administration Centers to rely on standard indicators and make data-driven decisions to leverage, protect, and maintain their identified strengths while implementing concrete measures to address weaknesses in high-priority areas. In doing so, these Centers will be better prepared to face future challenges, enhancing the research environment and enduring as an integral parts of their institution's research ecosystem.

## 10 RECOMMENDATIONS

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After analyzing the quantitative and qualitative data collected via the modified SERVQUAL survey, some guidelines and areas for improvement in the various units become apparent. The following sections present these recommendations, organized by unit.

### 10.1 PRE-AWARD - PROPOSAL DEVELOPMENT UNIT

- The Proposal Development Unit should take steps to maintain the perceived excellent quality of services noted by researchers. The R&D Center should prioritize employee retention and professional development to maximize the benefits it receives from its high-quality human capital. Due to the high performance observed in researchers' perceptions of this unit, the recommendations for this unit should be understood as guidelines for maximizing the impact of future enhancement initiatives rather than as performance improvement recommendations.
- According to the impact analysis performed for this office, decisions aimed at accurately communicating services' process time to researchers will have a higher impact on researchers' perception of service quality.
- Further inquiry should focus on researchers' expectations in regards to the time a service should take to be performed, and how employee interactions fit these expectations. The information should be complemented by collecting data about the time it takes to complete the main PDU services, and the overall time taken from when a service request is received to when the service is completed.

Due to the high service quality perceived by investigators, the PDU could be able to provide additional services or expand its scope of work. Researchers' recommendations to enhance and expand PDU services include:

- Increase the number of employees as an investment to obtain more external funds for research and education.
- Continue expanding its efforts to diversify UPRM funding sources, targeting investigators' specific interests.
- The addition of a "research development" role to the PDU, or the creation of a new office, "to deal with the big picture of research at UPRM." This role would involve collaborating with researchers, associate deans, and other interested parties to formulate strategic plans aimed at improving the research culture at UPRM.
- Promote activities between colleges to meet and share ideas to solve common problems.

## **10.2 PRE-AWARD - PROPOSAL SUBMISSION UNIT**

- This unit was also recognised for the excellent quality of the services it provides. The Proposal Submission Unit should take steps to maintain the high quality of service offered.
- There were no areas identified as critical for the PSU, but the impact analysis shows that future initiatives directed at improving investigators' perception on timeliness and their certainty that work will be completed within a specific timeframe would have a relatively strong effect on their opinion about the quality of service.
- Qualitative data indicates that the SERVQUAL results on investigators' perceptions about items related to timeliness and schedule certainty are directly linked to the high volume of proposals submitted by investigators and the limited number of staff members in this unit.

This workload is increased by other functions, beyond budget preparation and the submission of proposals, that are performed by the unit. It should be highlighted that investigators remark on the excellent work that the PSU's three employees perform to allow them to submit their proposals within the sponsors' deadlines. However, an increase in research activity or a temporary reduction in staffing during peak proposal submission times would likely result in an unsustainable workload for the current level of personnel. Hiring additional staff should be considered. This would enable the unit to continue functioning at its high service quality level, while permitting the future expansion of its scope of action to further benefit investigators.

- Another aspect that should be considered is for staff to maintain a record of the number of days before an external deadline that investigators are submitting their proposals for internal review. At the time, the internal deadline is seven business days, and not all investigators comply with this requirement. This situation reduces the time available to complete individual PSU services, which negatively affects scheduled work and can lead to a lower perception of timeliness and decreased certainty on the part of investigators receiving these services.
- Investigators voiced their displeasure in regards to the unit's office infrastructure, but since this was the lowest-ranked dimension in terms of researcher priorities there is not a pressing need to dedicate additional resources to this area for the improvement of perceived service quality. In the long term, it might prove beneficial to unite the PDU and the PSU in the PDU's office space. This change would address most investigators' complaints about meeting space and the overall office environment. While suitable arrangements can be made, PSU employees should communicate to investigators that they can make use of PDU

infrastructure for meetings that require privacy or space for multiple attendees.

Investigators might also wish to use the PDU conference room to work on their proposals.

Viable actions to enhance PSU services in accordance with researchers' recommendations may include:

- Provide better and more accessible Kuali Coeus resources, aimed at researchers who seldom submit proposals.
  - These investigators tend to forget the details involved in using the system due to the extended periods of time between their proposal submissions. In turn, the additional personal attention they require from PSU staff during proposal preparation increases the time required to complete the Kuali Coeus record and obtain approval for the proposal submission.
  - Improved online resources should focus on usability, allowing these investigators to follow along a tutorial instead of having to “relearn” the system every time.
- Develop and distribute guidelines to help researchers understand and anticipate the impact of indirect costs on their budget.
- Decrease the learning curve for researchers unfamiliar with the practices of particular agencies (e.g. National Institutes of Health or National Science Foundation) and requirements by providing generic templates of common documents.

### **10.3 POST-AWARD DIVISION**

This unit is composed of four offices: Accounting & Finance, Budget, Purchasing, and Human Resources. SERVQUAL results show a high potential for improvement. To address the critical



areas identified in the impact analysis as having a high impact on service quality perception, Post-Award offices can undertake the following initiatives:

- The highest priority for these offices should be reducing wait times, response times, and process times in the services offered to researchers. The perception problem in this area should be programmatically addressed by increasing process transparency and prioritizing promptness, *reliability*, and *responsiveness* in service interactions. This is a critical area that was highlighted by many investigators as an element that affects the management of project funds and the possibility of obtaining future funding.
  - A system should be implemented to obtain service metrics related to Post-Award processes, recording when service requests are received and the moment all following actions are taken. This data should then be analyzed to identify bottlenecks and necessary optimizations that would allow researchers to experience faster turnaround times and increased transparency in their Post-Award transactions. The R&D Center should consider involving faculty with subject-matter expertise in process engineering and business administration to assist with this task.
  - Evaluation of process changes should involve Post-Award staff input, to leverage their expertise and obtain their buy-in, while balancing compliance requirements against the pressing need to expedite service transactions.
  - An important step to address this problem is to clearly define the scope and expectations of each service position in Post-Award offices, while maintaining the flexibility and overlap that would allow multiple employees to perform a specific task. This would alleviate problems caused by temporary reductions in staffing due

to sick leave or vacation times. In the long term, staffing levels should be evaluated considering the office workloads to determine if understaffing is a large factor affecting process times.

- SERVQUAL results indicate that investigators feel low levels of trust during their Post-Award interactions, expressed through their low confidence that services will be performed adequately and their opinion that employees should be better prepared to carry out these functions. This can be addressed through the following measures:
  - Employees should have access to extensive training opportunities related to their principal duties, and be motivated to take advantage of these opportunities.
  - Internal R&D Center training should focus on sharing acquired knowledge, and include interactive or applied elements about common problems encountered in the administration of external funds.
- Investigators' perception of staff *empathy* dimension shows that, in general, more could be done to demonstrate that Post-Award staff have their best interests at heart. In order to have a productive working relationship with their clients, staff must communicate that they understand researchers' needs during the course of providing services and coming up with solutions that enable the successful completion of research projects. Some initiatives that can be undertaken to meet this goal are:
  - Post-Award offices should cultivate a culture that values and seeks increased process efficiency. Staff should act as facilitators during service interactions. A positive attitude and enthusiasm for assisting researchers should be fostered. Obtaining, analyzing, and acting upon service metrics is a crucial process to enable

a cultural shift, as the type of metrics prioritized by leadership communicates the shared goals for the office and the R&D Center.

- Adequate incentives should be provided to promote the adoption of a service attitude and increased productivity.
- Offices should take steps to increase the continuity, quantity, and quality of communication with investigators, especially when there are problems with their documents or service requests. Ideally, records of these communications should be integrated into a request tracking system to facilitate consistency, continuity, and accountability. This would enable future analysis of interaction patterns to identify recurring problems and possible optimizations.
- The R&D Center should collect and communicate evidence of the impact that its staff's work has on the development of a productive research community (Project outcomes, students involved, benefits to UPRM and its surrounding communities, etc.). This would help build a shared sense of purpose and bring to life the Center's mission and vision to staff, faculty, and administrators. Post-Award staff can communicate this knowledge and awareness of the value of UPRM research projects when interacting with investigators to build trust and demonstrate *empathy*.
- Some investigators remarked on the need for increased accountability amongst Post-Award staff. The R&D Center's current accountability mechanisms, such as formal evaluations, can be complemented with informal evaluation processes and an increased emphasis on overall service metrics. The R&D Center should consider including these metrics in its annual reports, and sharing them through other (less formal) channels to demonstrate to investigators that its offices engage in continuous improvement.

- Current hardware and software solutions should be assessed to determine if, as investigators perceive, they are hindering service quality. If this is the case, better equipment and/or software should be obtained and implemented to allow more efficient performance of Post-Award functions. A formal inquiry should be carried out, as even if some options are limited by the need to interface with UPR's system-wide software there could still be efficiency gains possible in other areas.

Viable actions to improve Post-Award services in accordance with researchers' recommendations may include:

- Take steps to reduce the delay between when money is spent and when these changes are reflected in researchers' accounts.
- Improve information management across Post-Award offices through software solutions that will enable information sharing across the unit, eliminate paperwork duplication, and allow the efficient production of reports on Post-Award activity.
- Consider adjusting processes related to international students to more effectively attend to the needs that stem from their status as non-US citizens.

#### **10.4 R&D CENTER (DIRECTOR'S OFFICE)**

- In varying degrees, resources should be dedicated across all service units to matters pertaining to prompt service and communication about scheduled work. Implementing a request-tracking system will allow offices to collect the internal data (lead time, process time, wait time) necessary to make adjustments and process optimizations to improve *responsiveness*.
- Develop tutorials and online resources to address questions that new investigators tend to have about grant administration.

- Coordinate staff to provide workshops to investigators focusing on Pre- and Post-Award procedures, rather than general information about services provided by the R&D Center.
- Dedicate resources and office supervisor time to improve the usability of the R&D Center website, with the goal of providing information and documentation that is clear and easy to find.
- Increase visibility and interaction of legal counsel with investigators to develop essential trust and rapport.
- Send monthly emails publicizing new contracts and grants obtained by UPRM researchers (PI's, project title, department, amount, agency, etc.).
- Conduct a pilot program to promote interaction between investigators and R&D Center employees, with the goal of fostering understanding of their mutual needs and priorities.
- Implement an internal electronic knowledge base to foster information sharing among R&D Center staff. This will improve consistency in investigator interactions, and facilitate faster onboarding of new staff.

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## **12 APPENDIXES**

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## Appendix A: SERVQUAL – Proposal Development Unit

### Expectations (E)

This section of the survey deals with your opinions of the **Proposal Development Offices** at an institution of higher education. **The Proposal Development Offices** support researchers in seeking and securing external funding. Please show the extent to which you think these **Offices** should have the following features. You should rank each statement as follows:

(select a number that best shows your expectation)

Strongly Disagree							Strongly Agree
1	2	3	4	5	6	7	

### Responsiveness

E1. Employees of excellent **Proposal Development Offices** will tell researchers exactly when services will be performed. \_\_\_\_\_

E2. Employees of excellent **Proposal Development Offices** will give prompt service to researchers. \_\_\_\_\_

E3. Employees of excellent **Proposal Development Offices** will always be willing to help researchers. \_\_\_\_\_

E4. Employees of excellent **Proposal Development Offices** will never be too busy to respond to researchers' requests. \_\_\_\_\_

### Perceptions (P)

This segment of the survey relates to your feelings about **the Proposal Development Unit at the R&DC-UPRM**. The Proposal Development Units assists UPRM investigators in seeking and securing external funding, by supporting the development of competitive proposals. Please show the extent to which you believe this **Office** has the feature described in the statement. You should rank each statement as follows: (select a number that best shows your perceptions)

Strongly Disagree							Strongly Agree
1	2	3	4	5	6	7	

### Responsiveness

P1. Employees in **The Proposal Development Unit at the R&DC-UPRM** tell you exactly when services will be performed. \_\_\_\_\_

P2. Employees in **The Proposal Development Unit at the R&DC-UPRM** give you prompt service. \_\_\_\_\_

P3. Employees in **The Proposal Development Unit at the R&DC-UPRM** are always willing to help you. \_\_\_\_\_

P4. Employees in **The Proposal Development Unit at the R&DC-UPRM** are never too busy to respond to your request. \_\_\_\_\_

Average Responsiveness SERVQUAL score \_\_\_\_\_

(P) Gap Score  
E-P

Reliability  
(E)

E5. When excellent <b>Proposal Development Offices</b> promise to do something by a certain time, they do.	_____	P5. When <b>the Proposal Development Unit at the R&amp;DC-UPRM</b> promises to do something by a certain time, it does so.	_____	E-P
E6. When a researcher has a problem, excellent <b>Proposal Development Offices</b> will show a sincere interest in solving it.	_____	P6. When you have a problem, <b>The Proposal Development Unit at the R&amp;DC-UPRM</b> shows a sincere interest in solving it.	_____	
E7. Excellent <b>Proposal Development Offices</b> will perform the service right the first time.	_____	P7. <b>The Proposal Development Unit at the R&amp;DC-UPRM</b> performs the service right the first time.	_____	
E8. Excellent <b>Proposal Development Offices</b> will provide the service at the time they promise to do so.	_____	P8. <b>The Proposal Development Unit at the R&amp;DC-UPRM</b> provides its service at the time it promises to do so.	_____	
E9. Excellent <b>Proposal Development Offices</b> will insist on error-free documents	_____	P9. <b>The Proposal Development Unit at the R&amp;DC-UPRM</b> insists on error-free documents	_____	
		<b>Average Reliability SERVQUAL score</b>		
				(P)
<b>Assurance</b>	(E)	<b>Assurance</b>		<b>Gap Score</b>
				E-P
E10. The behavior of employees in excellent <b>Proposal Development Offices</b> will instill confidence in researchers.	_____	P10. The behavior of employees in <b>the Proposal Development Unit at the R&amp;DC-UPRM</b> instills confidence in you.	_____	
E11. Researchers of excellent <b>Proposal Development Offices</b> will feel safe in their proposal design decisions.	_____	P11. You feel safe in your proposal design decisions with <b>the Proposal Development Unit at the R&amp;DC-UPRM</b> .	_____	
E12. Employees of excellent <b>Proposal Development Offices</b> will be consistently courteous with researchers.	_____	P12. Employees in <b>the Proposal Development Unit at the R&amp;DC-UPRM</b> are consistently courteous with you.	_____	
E13. Employees of excellent <b>Proposal Development Offices</b> will have the knowledge to answer researchers' questions.	_____	P13. Employees in <b>the Proposal Development Unit at the R&amp;DC-UPRM</b> have the knowledge to answer your questions.	_____	
		<b>Average Assurance SERVQUAL score</b>		
<b>Reliability</b>	(P)			<b>Gap Score</b>

Empathy	(E)	Empathy	(P)	Gap Score E-P
E14. Excellent <b>Proposal Development Offices</b> will give researchers individual attention.	_____	P14. <b>The Proposal Development Unit at the R&amp;DC-UPRM</b> gives you individual attention.	_____	_____
E15. Excellent <b>Proposal Development Offices</b> will have operating hours convenient to all their researchers.	_____	P15. <b>The Proposal Development Unit at the R&amp;DC-UPRM</b> has operating hours convenient to all their researchers.	_____	_____
E16. Excellent <b>Proposal Development Offices</b> will have employees who give researchers personal attention.	_____	P16. <b>The Proposal Development Unit at the R&amp;DC-UPRM</b> has employees who give you personal attention.	_____	_____
E17. Excellent <b>Proposal Development Offices</b> will have their researcher's best interests at heart.	_____	P17. <b>The Proposal Development Unit at the R&amp;DC-UPRM</b> has your best interest at heart.	_____	_____
E18. The employees of excellent <b>Proposal Development Offices</b> will understand the specific needs of their researchers.	_____	P18. The employees of <b>the Proposal Development Unit at the R&amp;DC-UPRM</b> understand your specific needs.	_____	_____
<b>Tangibles</b>	(E)	<b>Average Empathy SERVQUAL score</b>	(P)	<b>Gap Score E-P</b>
E19. Excellent <b>Proposal Development Offices</b> will have modern looking equipment.	_____	P19. <b>The Proposal Development Unit at the R&amp;DC-UPRM</b> has modern looking equipment.	_____	_____
E20. The physical environment at excellent <b>Proposal Development Offices</b> will be welcoming.	_____	P20. <b>The Proposal Development Unit at the R&amp;DC-UPRM's</b> physical environment is welcoming.	_____	_____
E21. Employees at excellent <b>Proposal Development Offices</b> will be neat in their appearance.	_____	P21. <b>The Proposal Development Unit at the R&amp;DC-UPRM's</b> reception desk employees are neat appearing.	_____	_____
E22. Materials associated with the (pamphlets or statements) will be visually appealing at an excellent <b>Proposal Development Offices</b> .	_____	P22. Materials associated with the services (pamphlets or statements) will be visually appealing at <b>the Proposal Development Unit at the R&amp;DC-UPRM</b> .	_____	_____
E23. The physical facilities at an excellent <b>Proposal Development Offices</b> are responsive to investigator's workspace needs.	_____	E23. The physical facility at <b>the Proposal Development Unit at the R&amp;DC-UPRM</b> is responsive to investigator's workspace needs.	_____	_____
E.24. The physical facilities at an excellent <b>Proposal Development Offices</b> are conducive to productive work	_____	E.24. The physical facility at an excellent <b>the Proposal Development Unit at the R&amp;DC-UPRM</b> is conducive to productive work	_____	_____
		<b>Average Tangibles SERVQUAL score</b>	_____	_____

**TABLE 1: CALCULATIONS TO OBTAIN UNWEIGHTED SERVQUAL SCORE**

Average Tangible SERVQUAL score	_____
Average Reliability SERVQUAL score	_____
Average Responsiveness SERVQUAL score	_____
Average Assurance SERVQUAL score	_____
Average Empathy SERVQUAL score	_____
TOTAL	_____
AVERAGE (= Total / 5) UNWEIGHTED SERVQUAL SCORE	<input type="text"/>



**Table 2: SERVQUAL IMPORTANCE WEIGHTS**

Listed below are five features pertaining to **Proposal Development Offices** and the services they offer. We would like to know how researchers prioritize these features. Allocate 100 points among the five features according to how important they are to you. **Make sure the points add up to 100.**

- |  |                   |
|--|-------------------|
| 1. The <b>Proposal Development Offices</b> ' willingness to help researchers and provide prompt service.                               | _____ points      |
| 2. The <b>Proposal Development Offices</b> ' ability to perform the promised service dependably and accurately.                        | _____ points      |
| 3. The knowledge and courtesy of the <b>Proposal Development Offices</b> ' employees and their ability to convey trust and confidence. | _____ points      |
| 4. The caring, individual attention the <b>Proposal Development Offices</b> provide its researchers.                                   | _____ points      |
| 5. The appearance of the <b>Proposal Development Offices</b> ' physical facilities, equipment, personnel, and communication materials. | _____ points      |
| <b>Total:</b>  | <b>100 points</b> |

## Appendix B: SERVQUAL –Proposal Submission Unit

### Expectations (E)

This section of the survey deals with your opinions of the **Proposal Submission Offices** at an institution of higher education. **The Proposal Submission Offices** are responsible for supporting researchers in reviewing, endorsing, and submitting proposals to external sponsors. Please show the extent to which you think these **Offices** should have the following features. You should rank each statement as follows:

(select a number that best shows your expectation)

Strongly Disagree							Strongly Agree
1	2	3	4	5	6		7

(E)

### Responsiveness

- E1. Employees of excellent **Proposal Submission Offices** will tell researchers exactly when services will be performed. \_\_\_\_\_
- E2. Employees of excellent **Proposal Submission Offices** will give prompt service to researchers. \_\_\_\_\_
- E3. Employees of excellent **Proposal Submission Offices** will always be willing to help researchers. \_\_\_\_\_
- E4. Employees of excellent **Proposal Submission Offices** will never be too busy to respond to researchers' requests. \_\_\_\_\_

### Perceptions (P)

This segment of the survey relates to your feelings about **the Proposal Submission Unit at the R&DC-UPRM** (formerly the Office of External Resources). **The Proposal Submission Units** at UPRM is responsible for assisting the R&D directors in reviewing budgets, endorsing, and submitting proposals to external sponsors. Please show the extent to which you believe this **Office** has the feature described in the statement. You should rank each statement as follows: (select a number that best shows your perceptions)

Strongly Disagree							Strongly Agree
1	2	3	4	5	6		7

(P)      **Gap Score**  
E-P

### Responsiveness

- P1. Employees in **The Proposal Submission Unit at the R&DC-UPRM** tell you exactly when services will be performed. \_\_\_\_\_
- P2. Employees in **The Proposal Submission Unit at the R&DC-UPRM** give you prompt service. \_\_\_\_\_
- P3. Employees in **The Proposal Submission Unit at the R&DC-UPRM** are always willing to help you. \_\_\_\_\_
- P4. Employees in **The Proposal Submission Unit at the R&DC-UPRM** are never too busy to respond to your request. \_\_\_\_\_

**Average Responsiveness SERVQUAL score** \_\_\_\_\_

Reliability	(E)	Reliability	(P)	Gap Score
				E-P
E5. When excellent <b>Proposal Submission Offices</b> promise to do something by a certain time, they do.	<hr/>	P5. When <b>the Proposal Submission Unit at the R&amp;DC-UPRM</b> promises to do something by a certain time, it does so.	<hr/>	<hr/>
E6. When a researcher has a problem, excellent <b>Proposal Submission Offices</b> will show a sincere interest in solving it.	<hr/>	P6. When you have a problem, <b>The Proposal Submission Unit at the R&amp;DC-UPRM</b> shows a sincere interest in solving it.	<hr/>	<hr/>
E7. Excellent <b>Proposal Submission Offices</b> will perform the service right the first time.	<hr/>	P7. <b>The Proposal Submission Unit at the R&amp;DC-UPRM</b> performs the service right the first time.	<hr/>	<hr/>
E8. Excellent <b>Proposal Submission Offices</b> will provide the service at the time they promise to do so.	<hr/>	P8. <b>The Proposal Submission Unit at the R&amp;DC-UPRM</b> provides its service at the time it promises to do so.	<hr/>	<hr/>
E9. Excellent <b>Proposal Submission Offices</b> will insist on error-free documents		P9. <b>The Proposal Submission Unit at the R&amp;DC-UPRM</b> insists on error-free documents		<hr/>

**Average Reliability SERVQUAL score**

(E)		(P)		Gap Score E-P
Assurance		Assurance		
E10. The behavior of employees in excellent <b>Proposal Submission Offices</b> will instill confidence in researchers.	_____	P10. The behavior of employees in <b>the Proposal Submission Unit at the R&amp;DC-UPRM</b> instills confidence in you.	_____	_____
E11. Researchers of excellent <b>Proposal Submission Offices</b> will feel safe in their proposal design decisions.	_____	P11. You feel safe in your proposal design decisions with <b>the Proposal Submission Unit at the R&amp;DC-UPRM.</b>	_____	_____
E12. Employees of excellent <b>Proposal Submission Offices</b> will be consistently courteous with researchers.	_____	P12. Employees in <b>the Proposal Submission Unit at the R&amp;DC-UPRM</b> are consistently courteous with you.	_____	_____
E13. Employees of excellent <b>Proposal Submission Offices</b> will have the knowledge to answer researchers' questions.	_____	P13. Employees in <b>the Proposal Submission Unit at the R&amp;DC-UPRM</b> have the knowledge to answer your questions.	_____	_____
		<b>Average Assurance SERVQUAL score</b>		_____

Empathy	(E)	Empathy	(P)	Gap Score E-P
E14. Excellent <b>Proposal Submission Offices</b> will give researchers individual attention.	_____	P14. <b>The Proposal Submission Unit at the R&amp;DC-UPRM</b> gives you individual attention.	_____	_____
E15. Excellent <b>Proposal Submission Offices</b> will have operating hours convenient to all their researchers.	_____	P15. <b>The Proposal Submission Unit at the R&amp;DC-UPRM</b> has operating hours convenient to all their researchers.	_____	_____
E16. Excellent <b>Proposal Submission Offices</b> will have employees who give researchers personal attention.	_____	P16. <b>The Proposal Submission Unit at the R&amp;DC-UPRM</b> has employees who give you personal attention.	_____	_____
E17. Excellent <b>Proposal Submission Offices</b> will have their researcher's best interests at heart.	_____	P17. <b>The Proposal Submission Unit at the R&amp;DC-UPRM</b> has your best interest at heart.	_____	_____
E18. The employees of excellent <b>Proposal Submission Offices</b> will understand the specific needs of their researchers.	_____	P18. The employees of <b>the Proposal Submission Unit at the R&amp;DC-UPRM</b> understand your specific needs.	_____	_____
<b>Tangibles</b>	(E)	<b>Tangibles</b>	Average Empathy SERVQUAL score (P)	Gap Score E-P
E19. Excellent <b>Proposal Submission Offices</b> will have modern looking equipment.	_____	P19. <b>The Proposal Submission Unit at the R&amp;DC-UPRM</b> has modern looking equipment.	_____	_____
E20. The physical environment at excellent <b>Proposal Submission Offices</b> will be welcoming.	_____	P20. <b>The Proposal Submission Unit at the R&amp;DC-UPRM's</b> physical environment is welcoming.	_____	_____
E21. Employees at excellent <b>Proposal Submission Offices</b> will be neat in their appearance.	_____	P21. <b>The Proposal Submission Unit at the R&amp;DC-UPRM's</b> reception desk employees are neat appearing.	_____	_____
E22. Materials associated with the (pamphlets or statements) will be visually appealing at an excellent <b>Proposal Submission Offices</b> .	_____	P22. Materials associated with the services (pamphlets or statements) will be visually appealing at <b>the Proposal Submission Unit at the R&amp;DC-UPRM</b> .	_____	_____
E23. The physical facilities at an excellent <b>Proposal Submission Offices</b> are responsive to investigator's workspace needs.	_____	E23. The physical facility at <b>the Proposal Submission Unit at the R&amp;DC-UPRM</b> is responsive to investigator's workspace needs.	_____	_____
E.24. The physical facilities at an excellent <b>Proposal Submission Offices</b> are conducive to productive work	_____	E.24. The physical facility at an excellent <b>the Proposal Submission Unit at the R&amp;DC-UPRM</b> is conducive to productive work	_____	_____
			Average Tangibles SERVQUAL score	_____

**TABLE 1: CALCULATIONS TO OBTAIN UNWEIGHTED SERVQUAL SCORE**

Average Tangible SERVQUAL score	_____
Average Reliability SERVQUAL score	_____
Average Responsiveness SERVQUAL score	_____
Average Assurance SERVQUAL score	_____
Average Empathy SERVQUAL score	_____
TOTAL	_____
AVERAGE (= Total / 5) UNWEIGHTED SERVQUAL SCORE	<input type="text"/>

## Table 2: SERVQUAL IMPORTANCE WEIGHTS

Listed below are five features pertaining to **Proposal Submission Offices** and the services they offer. We would like to know how researchers prioritize these features. Allocate 100 points among the five features according to how important they are to you. **Make sure the points add up to 100.**

1. The **Proposal Submission Offices'** willingness to help researchers and provide prompt service. \_\_\_\_\_ points
2. The **Proposal Submission Offices'** ability to perform the promised service dependably and accurately. \_\_\_\_\_ points
3. The knowledge and courtesy of the **Proposal Submission Offices'** employees and their ability to convey trust and confidence. \_\_\_\_\_ points
4. The caring, individual attention the **Proposal Submission Offices** provide its researchers. \_\_\_\_\_ points
5. The appearance of the **Proposal Submission Offices'** physical facilities, equipment, personnel, and communication materials. \_\_\_\_\_ points

**Total: 100 points**

## Appendix C: SERVQUAL – Post- Award Division

### Expectations (E)

This section of the survey deals with your opinions of the **Offices of Sponsored Programs (project) - Post- Award Divisions** at an institution of higher education. **The Post- Award Divisions** are in charge of managing all funded awards (grants and contracts) and of providing support services for the administration of the projects. Please show the extent to which you think a **Post-Award Division** should have the following features. You should rank each statement as follows: (select a number that best shows your expectation)

Strongly Disagree							Strongly Agree
1	2	3	4	5	6	7	
							(E)

### Responsiveness

- E1. Employees of excellent **Post- Award Divisions** will tell researchers exactly when services will be performed. \_\_\_\_\_
- E2. Employees of excellent **Post- Award Divisions** will give prompt service to researchers. \_\_\_\_\_
- E3. Employees of excellent **Post- Award Divisions** will always be willing to help researchers. \_\_\_\_\_
- E4. Employees of excellent **Post- Award Divisions** will never be too busy to respond to researchers' requests. \_\_\_\_\_

### Perceptions (P)

This segment of the survey relates to your feelings about **the Post- Award Offices at the R&DC-UPRM**. The Post- Award **Offices** at UPRM have the responsibility of managing all R&DC funded award (grants and contracts) and of providing support services for the administration of the projects within the R&DC premises. Please show the extent to which you believe these **Offices** have the feature described in the statement. You should rank each statement as follows: (select a number that best shows your perceptions)

Strongly Disagree							Strongly Agree	
1	2	3	4	5	6	7		
							(P)	Gap Score E-P

### Responsiveness

- P1. Employees in **The Post- Award Offices at the R&DC-UPRM** tell you exactly when services will be performed. \_\_\_\_\_
- P2. Employees in **The Post- Award Offices at the R&DC-UPRM** give you prompt service. \_\_\_\_\_
- P3. Employees in **The Post- Award Offices at the R&DC-UPRM** are always willing to help you. \_\_\_\_\_
- P4. Employees in **The Post- Award Offices at the R&DC-UPRM** are never too busy to respond to your request. \_\_\_\_\_

Average Responsiveness SERVQUAL score

\_\_\_\_\_

Reliability	(E)	Reliability	(P)	Gap Score E-P
E5. When excellent <b>Post- Award Divisions</b> promise to do something by a certain time, they do.	_____	P5. When <b>the Post- Award Offices at the R&amp;DC-UPRM</b> promise to do something by a certain time, they do so.	_____	_____
E6. When a researcher has a problem, excellent <b>Post- Award Divisions</b> will show a sincere interest in solving it.	_____	P6. When you have a problem, <b>The Post- Award Offices at the R&amp;DC-UPRM</b> show a sincere interest in solving it.	_____	_____
E7. Excellent <b>Post- Award Divisions</b> will perform the service right the first time.	_____	P7. <b>The Post- Award Offices at the R&amp;DC-UPRM</b> perform the service right the first time.	_____	_____
E8. Excellent <b>Post- Award Divisions</b> will provide the service at the time they promise to do so.	_____	P8. <b>The Post- Award Offices at the R&amp;DC-UPRM</b> provide their services at the time they promise to do so.	_____	_____
E9. Excellent <b>Post- Award Divisions</b> will insist on error-free records	_____	P9. <b>The Post- Award Offices at the R&amp;DC-UPRM</b> insist on error-free records	_____	_____
	(E)		Average Reliability SERVQUAL score	Gap Score E-P
Assurance		Assurance	(P)	
E10. The behavior of employees in excellent <b>Post- Award Divisions</b> will instill confidence in researchers.	_____	P10. The behavior of employees in <b>the Post- Award Offices at the R&amp;DC-UPRM</b> instills confidence in you.	_____	_____
E11. Researchers of excellent <b>Post- Award Divisions</b> will feel confident performing transactions.	_____	P11. You feel confident making transactions with <b>the Post- Award Offices at the R&amp;DC-UPRM</b> .	_____	_____
E12. Employees of excellent <b>Post- Award Divisions</b> will be consistently courteous with researchers.	_____	P12. Employees in <b>the Post- Award Offices at the R&amp;DC-UPRM</b> are consistently courteous with you.	_____	_____
E13. Employees of excellent <b>Post- Award Divisions</b> will have the knowledge to answer researchers' questions.	_____	P13. Employees in <b>the Post- Award Offices at the R&amp;DC-UPRM</b> have the knowledge to answer your questions.	_____	_____
			Average Assurance SERVQUAL score	_____



	(E)		(P)	Gap Score E-P
<b>Empathy</b>		<b>Empathy</b>		
E14. Excellent <b>Post- Award Divisions</b> will give researchers individual attention.	_____	P14. <b>The Post- Award Offices at the R&amp;DC-UPRM</b> give you individual attention.	_____	_____
E15. Excellent <b>Post- Award Divisions</b> will have operating hours convenient to all their researchers.	_____	P15. <b>The Post- Award Offices at the R&amp;DC-UPRM</b> have operating hours convenient to all their researchers.	_____	_____
E16. Excellent <b>Post- Award Divisions</b> will have employees who give researchers personal attention.	_____	P16. <b>The Post- Award Offices at the R&amp;DC-UPRM</b> have employees who give you personal attention.	_____	_____
E17. Excellent <b>Post- Award Divisions</b> will have their researcher's best interests at heart.	_____	P17. <b>The Post- Award Offices at the R&amp;DC-UPRM</b> have your best interest at heart.	_____	_____
E18. The employees of excellent <b>Post- Award Divisions</b> will understand the specific needs of their researchers.	_____	P18. The employees of <b>the Post- Award Offices at the R&amp;DC-UPRM</b> understand your specific needs.	_____	_____
		<b>Average Empathy SERVQUAL score</b>		_____
	(E)		(P)	Gap Score E-P
<b>Tangibles</b>		<b>Tangibles</b>		
E19. Excellent <b>Post- Award Divisions</b> will have modern looking equipment.	_____	P19. <b>The Post- Award Offices at the R&amp;DC-UPRM</b> have modern looking equipment.	_____	_____
E20. The physical environment at excellent <b>Post- Award Divisions</b> will be welcoming.	_____	P20. <b>The Post- Award Offices at the R&amp;DC-UPRM's</b> physical environment are welcoming.	_____	_____
E21. Employees at excellent <b>Post- Award Divisions</b> will be neat in their appearance.	_____	P21. <b>The Post- Award Offices at the R&amp;DC-UPRM's</b> reception desk employees are neat appearing.	_____	_____
E22. Excellent <b>Post-Award Divisions</b> will have user friendly materials associated with the services (web page information, documents).	_____	P22. <b>The Post- Award Offices at the R&amp;DC-UPRM</b> have user friendly materials associated with the services (web page information, documents).	_____	_____
		<b>Average Tangibles SERVQUAL score</b>		_____

**TABLE 1: CALCULATIONS TO OBTAIN UNWEIGHTED SERVQUAL SCORE**

Average Tangible SERVQUAL score	_____
Average Reliability SERVQUAL score	_____
Average Responsiveness SERVQUAL score	_____
Average Assurance SERVQUAL score	_____
Average Empathy SERVQUAL score	_____
TOTAL	_____
AVERAGE (= Total / 5) UNWEIGHTED SERVQUAL SCORE	<input type="text"/>

## Table 2: SERVQUAL IMPORTANCE WEIGHTS

Listed below are five features pertaining to **Post- Award Offices** and the services they offer. We would like to know how researchers prioritize these features. Allocate 100 points among the five features according to how important they are to you. **Make sure the points add up to 100.**

1. The **Post- Award Offices'** willingness to help researchers and provide prompt service. \_\_\_\_\_ points
2. The **Post- Award Offices'** ability to perform the promised service dependably and accurately. \_\_\_\_\_ points
3. The knowledge and courtesy of the **Post- Award Offices'** employees and their ability to convey trust and confidence. \_\_\_\_\_ points
4. The caring, individual attention the **Post- Award Offices** provide its researchers. \_\_\_\_\_ points
5. The appearance of the **Post- Award Offices'** physical facilities, equipment, personnel, and communication materials. \_\_\_\_\_ points

**Total: 100 points**

## Appendix D: Institutional Review Board Approval



**Comité para la Protección de los Seres Humanos en la Investigación  
CPSHI/IRB 00002053**

Universidad de Puerto Rico – Recinto Universitario de Mayagüez  
Decanato de Asuntos Académicos  
Call Box 9000  
Mayagüez, PR 00681-9000



28 de enero de 2016

Vanessa Torres García  
Administración de Empresas  
RUM

Estimada Sra. Torres:

El Comité para la Protección de los Seres Humanos en la Investigación (CPSHI) ha considerado su proyecto titulado *Evaluación de la calidad de los servicios ofrecidos a los clientes del Centro de Investigación y Desarrollo de la Universidad de Puerto Rico* (# Protocolo 20150911). Luego de evaluar el mismo hemos certificado que este cumple con todos los requisitos para ser aprobado como exento bajo la Categoría 5 del 45 CFR 46.101(b). La determinación de exención implica que su proyecto no requiere ser re-evaluado ni re-autorizado por nuestro comité. Le recordamos que la aprobación emitida por nuestro comité no lo exime de cumplir con cualquier otro requisito institucional o gubernamental relacionado al tema o fuente de financiamiento de su proyecto.

Cualquier cambio al protocolo o a la metodología que altere los criterios de exención deberá ser revisado y aprobado por el CPSHI ANTES de su implantación, excepto en casos en que el cambio sea necesario para eliminar algún riesgo inmediato para los/as participantes. El CPSHI deberá ser notificado de dichos cambios tan pronto le sea posible al/ a la investigador/a. Igualmente, el CPSHI deberá ser informado de inmediato de cualquier efecto adverso o problema inesperado que surgiera con relación al riesgo de los seres humanos, de cualquier queja sobre la conducción de esta investigación y de cualquier violación a la confidencialidad de los participantes.

Atentamente,

Dr. Rafael A. Boglio Martínez  
Presidente  
CPSHI/IRB  
UPR - RUM

## Appendix E: Notice to Researchers

Dear Researcher,

**Please remember** to complete the survey about the quality of services received from the **UPRM R&D Center** (also known as CID). **If you have started the survey your answers are still there, but they will expire soon\*\*.**

Your answers will have a direct impact on the direction and focus of future improvement efforts at UPRM R&D Center. Furthermore, you will be helping me complete my thesis project.

You can find the link in an email sent from [cid@uprm.edu](mailto:cid@uprm.edu) to your email inbox.

Thank you for your collaboration.



Vanessa Torres García  
Graduate Student  
College of Business Administration – UPRM  
[Vanessa.torres5@upr.edu](mailto:Vanessa.torres5@upr.edu)

\*\*You should continue in the same computer you started.

## Appendix F: Individual Reminder to Researchers

**Dear Researcher,**

Institutional records show you have received services from the UPRM R&D Center (also known as CID). We would like to know your thoughts about the quality of these services to drive future improvements. Furthermore, your participation will be helping me complete my thesis project.

You can complete the survey by going to the following link :

<http://cid.uprm.edu/index.php/group1/>. You can also find the link in an email sent from [cid@uprm.edu](mailto:cid@uprm.edu) to your email inbox. If you have started the survey your answers are still there, but they will expire soon\*\*.

Thank you for your collaboration.



Vanessa Torres García  
Graduate Student  
College of Business Administration – UPRM  
[Vanessa.torres5@upr.edu](mailto:Vanessa.torres5@upr.edu)

\*\*You should continue in the same computer you started.