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**Metric VIEWS** 

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# MEASURING THE IMMEASURABLE: AN IN-DEPTH LOOK AT AI METRICS

ISMA22: IT VALUE TO THE BUSINESS

ENGAGING THE C-SUITE ABOUT THE VALUE OF FUNCTIONAL MEASUREMENT



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IFPUG is committed to publishing timely articles related to function and non-functional software measurement in every issue of *MetricViews*. While each article is reviewed for relevancy and clarity, articles, especially those that are innovative and thought-provoking, are not necessarily endorsed by IFPUG.

### **MESSAGE FROM THE PRESIDENT**



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#### Dear Readers,

Welcome to the spring issue of IFPUG's *MetricViews*, your premier destination for exploring the intricacies of software measurement and estimation through the lens of functional and non-functional sizing.

In this edition, we delve deep into the world of function points, a powerful metric that has revolutionized the way software projects are planned, managed, and executed. From understanding how function points can be applied to automated testing scenarios to sizing agile projects, this issue aims to provide you with the insights you need to handle these scenarios. With this set of *MetricsViews* articles, I am reminded of the profound impact this metric has had on our approach to organizing, planning, and carrying out software development projects.

One of our featured articles brings in insightful thoughts of how to apply function points in an artificial intelligence (AI) context. The thing to notice in the application of function point sizing is how and where you are applying it. Data engineering is an activity within AI context. Many times, data engineering may be a standalone project. While in some areas of AI domain, we do have a direct application of IFPUG sizing standards, there are still some other areas where work needs be done by the industry to cover the gaps. For the same reason, our FSSC and NFSSC teams are looking to continuously assess the gaps in newer environments and take actions to shape the standards to address future needs.

With an overall delivery vision, Joe Schofield presented his thoughts on how to measure the software delivery in a complete way and trigger the meaningful conversations with stakeholders. In his article, Joe raises a fundamental point of what matters to CXOs - Is it really the sizing metric or something else beyond sizing? So, if the business need is to drive efficiency, improve productivity, and deliver value, then the unit of measurement may be inherent to get these outcomes but not the crux of the discussion.

Additionally, I would like to inform our readers about the upcoming ISMA22 event that will take place in Madrid, Spain in October. We are dedicated to advancing function point analysis best practices and standards with an enriching experience through our in-person conferences. Here's your chance to connect with like-minded people. Our carefully chosen content is intended to give you the skills and resources you need to be successful in your measurement journey, regardless of your level of experience.

Two new teams have come to life at IFPUG in the last quarter namely—the Training Program Taskforce and the Forecast and Software Estimation Committee under the leadership of Christine Green (IFPUG Past President). Wishing the team members very good luck as they start their journey in the IFPUG world.

I would like to express my gratitude to our talented team of writers, editors, and contributors for their hard work and dedication in bringing this issue to life. And to you, our readers, I extend my heartfelt thanks for your continued support and engagement.

Warm regards,

**Roopali Anand Thapar** IFPUG President

Europe has a major event just a few months away. Travelers from across the continent and the world will soon descend upon one of Europe's largest cities filling hotel rooms, local venues and restaurants. Visitors will have no shortage of viewpoints, opinions, and ideas. Top talent will showcase their skills, and activities will be shared worldwide for those who can't make it in person. Of course I am referring to ISMA22 in Madrid, Spain in October. You didn't think I was referring to the Summer Olympics in Paris, or did you? I'm sure the Olympics will have some success as well, but Madrid will be the place to be in early October.

With due respect to both of these events, I'm announcing the first-ever IFPUG Olympics to run as part of ISMA24 this fall. That's also correct; I'm changing the number for the ISMA conference to coincide with the year of the event; after all, it's just a number—but now it will have a disambiguated meaning. Imagine teams, perhaps representing their countries, analyzing (this is the measurement and analysis conference) a live case study with hopes of winning the gold for the most function points discovered, the largest data and transaction function types, the number of SNAP points identified, the quickest simple function point count, and the fastest times for the team to complete their work relative to the number of function points and team members—a new competition metric! In addition to the top performers winning the gold, silver and bronze medals could be awarded also to help sustain and build the software measurement community. Steroids aren't allowed in the Olympics and AI wouldn't be allowed in the IFPUG Olympics. Let's dream big. Consider how the number of events could grow in the future. Think about what Winter games could look like!

If you're excited about the IFPUG Olympics in Madrid in October, I must admit that they really have not been incorporated into ISMA22. Nor has the IFPUG Board adopted using the calendar year appended to ISMA for its conference name; that is, ISMA24. Until my amazing ideas are warmly embraced and adopted with all due attribution, and in preparation for that day, don't miss the articles in this Spring Edition of MetricViews. A range of topics with authors from three continents are certain to help you with your training for those not-yet-happening IFPUG Olympics. This issue's articles explore functional sizing related to automated testing, AI software's impact on functional and non-functional sizing, the planning and monitoring of agile-driven development with Kanban, and lastly, reflections and suggestions for penetrating the C-suite with discussions about software measurement.

I suppose one could treat the release of this issue as a "major event" much like ISMA22. Its reach, your reach, builds the software measurement community transcending geographic boundaries, measurement philosophies, and millennia. I know Madrid will be prepared. Mark your calendar.

Be well, stay well.

Joe Schofield

Editor, Past President, Honorary Fellow

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# FEATURE ARTICLE



# ISMA 22 - IT VALUE TO THE BUSINESS

#### By: Kiran Yeole and Julián Gómez

n the heart of Madrid, a pivotal event is set to take place, drawing the attention of tech enthusiasts, business leaders, and software professionals alike. The upcoming ISMA22 (International Software Metrics & Analysis) conference by IFPUG promises

to delve deep into the intricacies of IT's value to businesses, shedding light on the critical role software sizing plays in driving innovation, efficiency, and profitability. This event is happening after a gap of almost five years; IFPUG is excited to announce that this will be a hybrid conference with the opportunities to participate either in-person or virtually.

The ISMA22 conference has been approved as an eligible event for certification extension credits towards IFPUG CFPS and CSS certifications. ISMA22 also enables you to earn PMI PDUs, PeopleCert CPDs and CEPAS SCH174 Training Credits.

Hosted in the vibrant city of Madrid, this conference serves as a melting pot of ideas, where experts from around the globe will converge to share insights, exchange experiences, and chart the future of software sizing. With the main theme centering around **"IT Value to the Business,"** attendees can expect a rich tapestry of discussions, workshops, and networking opportunities tailored to address the pressing challenges and emerging trends in the realm of IT and business integration.

At the core of this conference lies the recognition that software sizing is not merely a technical endeavor but a strategic imperative for businesses seeking to thrive in an increasingly digital landscape. By accurately assessing the size and complexity of software projects, organizations can make informed decisions, allocate resources effectively, and deliver solutions that align with business objectives.

The conference agenda is carefully curated to cover a wide spectrum of topics, ranging from best practices in software measurement and estimation to the latest advancements in sizing methodologies and tools. Participants will have the opportunity to gain insights from industry luminaries, academic researchers, and seasoned practitioners, who will share their experiences and lessons learned from real-world projects.

# **ISMA22 - IT VALUE TO THE BUSINESS**

In addition to informative sessions and thought-provoking discussions, the conference will feature interactive workshops and case studies, providing participants with practical tools and techniques to enhance their software sizing capabilities. From agile development practices to DevOps methodologies, attendees will discover actionable strategies to streamline their software delivery processes and drive continuous improvement within their organizations.

As the sun sets over the picturesque skyline of Madrid, participants will leave the conference inspired, enlightened, and equipped with the knowledge and insights needed to unlock the full potential of software sizing in driving IT value to the business. Whether you're a seasoned IT professional, a business executive, or an aspiring entrepreneur, this conference is a must-attend event for anyone passionate about harnessing the power of technology to fuel business growth and innovation.

Mark your calendars for **October 4, 2024**, and join us in **Madrid** for a transformative journey into the world of software sizing and its profound impact on the future of business.

ISMA22 will feature nine interesting sessions and a few workshops on the day before and the day after the conference.

For the full conference schedule and registration details, visit https://ifpug.org/learning-and-events/isma. Don't miss out on this unparalleled opportunity to be part of a truly groundbreaking event!

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### -5- SNAP Software Non-Functional Assessment Process

# MEASURING THE IMMEASURABLE: AN IN-DEPTH LOOK AT AI METRICS

#### By: Tetyana Komarova

he purpose of this article is to reflect on the future of software metrics methodologies and to provide a brief analysis of the tools currently offered by the IFPUG and SNAP methodologies.

Artificial Intelligence (AI) is continuously evolving and revolutionizing our world. This process involves a wide range of disciplines, from computer science to statistics, from mathematics to cognitive psychology. However, accurately and meaningfully measuring AI represents a complex challenge that requires the adoption of specific guidelines.

It is essential to integrate existing metrics with complements that allow the evaluation of new aspects of AI, such as interpretability, ethics, and trust. Traditional metrics may not be sufficient to fully capture the breadth and complexity of this field. These complements should consider the complexity of algorithms, the generalization capability of models, and the robustness of machine learning. Additionally, it is crucial to carefully evaluate the data sources used, controlling both quantity and quality, and assessing the possibility of certifying reliable sources. In the world of AI and software metrics, data plays a fundamental role. We are talking about huge amounts of data that arrive rapidly and come in all imaginable types. Managing this mass of information is no small feat, but it is crucial to achieve quality results. Let us remember that the true value of AI lies primarily in data management and analysis.

When evaluating AI, we cannot limit ourselves to the end-user's perspective. It is necessary to consider the underlying technical complexity and ask ourselves how much we can actually trust the proposed solutions. There are still open questions for which we do not have definitive answers. For example, how can we accurately evaluate the interpretability of AI solutions? And what metrics can effectively measure the trust we can place in an AI system?

Measuring AI requires a comprehensive and multidimensional approach, taking into account both the user experience and the underlying technical complexity. At the same time, it is important to recognize that there are still unanswered questions and open discussion points that require further investigation and research.

Now let's look at a concrete example and explore some preliminary concepts.

**Weak AI:** It is designed to perform specific and limited tasks, such as speech recognition or image classification.

The steps we take initially are:

**Data collection:** We start by collecting and preparing large amounts of data relevant to the Al's goal.

Algorithm selection: We select the most suitable algorithm for the type of problem to be solved and the available data. Depending on the problem type (e.g., classification, regression, clustering, etc.), different types of algorithms are considered. For example, for classification problems, algorithms such as Support Vector Machines (SVMs), artificial neural networks, or decision trees could be used.

**Model training:** We use the collected data to train the AI model, which can be supervised or unsupervised.

**Optimization:** We adjust the algorithm parameters to improve the model's performance.

**Evaluation and testing:** We evaluate the AI model using test data to ensure it is accurate and reliable.

**Implementation and monitoring:** Once the model is ready, it is implemented in the operating environment and monitored to ensure its proper functioning over time.

To get an overview of what we will need to measure, let's consider a simple but relevant case. Let's imagine a predictive AI application that relies on historical or current data to make forecasts. This type of AI is widely used in various sectors, from marketing to finance, from healthcare to e-commerce. A concrete example is Netflix's recommendation system, which analyzes past viewing behaviors to suggest new content that may interest users.

In another scenario, let's consider an application that estimates the price of a house based on its location and square footage. The main goal is to define the house price based on these characteristics. To tackle this challenge, we choose to use linear regression as the machine learning algorithm. This algorithm provides a solid foundation due to its ability to model linear relationships between the variables involved, such as the house price, location, and square footage.



Linear regression belongs to the category of supervised learning, which means it requires a set of labeled data to train the model. During the training process, the model learns to identify patterns in the input data and make predictions based on these patterns.

Measuring AI requires a comprehensive and multidimensional approach, taking into account both the user experience and the underlying technical complexity.

To begin, we collected historical data on house sales from the past three years, including information such as the asking price and the actual selling price. This data was obtained from reliable sources in the real estate industry and gathered by local real estate agents.

Before proceeding with model training, it is essential to properly prepare the data. This data pre-processing process includes several activities:

- Converting data into usable formats: we converted raw data into standardized formats compatible with the linear regression algorithm.
- Managing redundant information: we identified and removed any duplicates or unnecessary information that could compromise the model's accuracy.





 Applying normalization and scaling techniques: we standardized the different measurement scales of the data, ensuring consistency and uniformity during the training process.

Once trained, we evaluated the model's performance using a separate test data set, composed of new observations not used during training. This evaluation phase allowed us to verify the accuracy and reliability of the model's predictions.

The final result was assessed by a multidisciplinary team consisting of real estate experts, data analysts, and software engineers. This team evaluated the quality of the model's predictions by comparing them with the expectations of the local real estate market and identifying any areas for improvement.

### Let's Try to Measure AI Using the IFPUG FPA and SNAP Metrics

#### **Estimation of Functional User Requirements (FUR):**

**Identified data entities:** Zone, House Characteristics, Other Price Factors (3 Low-Complexity ILFs: 21 FP)

**Note:** It could be useful to apply the techniques examined in previous years and reported in the iTips and White Papers related to the measurement of data parts for Data Warehouse systems.

**Processes:** Data Acquisition, Data Analysis, Price Generation.

#### **FP Estimation:**

**Data Acquisition:** A screen was developed for manual input by agents, and a possibility of historical data acquisition via CSV file (2 Medium-Complexity EIs: 8 FP)

Data Analysis, Algorithm Selection, Training: Considering non-functional requirements.

Price Output: 1 Medium-Complexity EO: 5 FP.

**Total FP:** 34 for the estimated effort of 40 days of work for the team of 3 people in our case.

#### Estimation of Non-Functional Requirements (NFR):

For some requirements, the application of the following SNAP categories may be considered:

**Data Collection and Quality:** Availability and quantity of accurate and representative data:

1.1. Data Entry Validations; 1.3. Data formatting; 1.5. Delivering added value to users by data configuration; 3.2. Database Technology;

**Algorithms and Models:** Selection of appropriate algorithms and models:

1.2. Logical and Mathematical Operations; 1.4. Internal Data Movements; 3.3. Batch Processes;

Considering the existence of ready-to-use libraries, 4.1. Component-based software.

**Training and Optimization:** The AI training process, including hyperparameter tuning and model optimization.

1.4. Internal Data Movements; 1.5. Delivering added value to users by data configuration;

Some requirements may result in either not being evaluated or being evaluated incompletely:

**Reliability:** The ability to interpret and explain decisions made by AI is important for its acceptance.

**Scalability and robustness:** Handling large volumes of data and maintaining high performance even under high load conditions.

**Ethics and security:** Ethical and security aspects, management of sensitive data privacy.

**Testing and validation:** Analysis and definition of expected results, acceptance of defects. Testing and validation cannot be considered requirements but are integral parts of software activities necessary to meet both FUR and NFR. For AI, these activities are highly significant.

**Management of updates:** Consideration of changes in the context, such as the opening of new infrastructures that may influence market prices.

Considering the various factors influencing the time required for data collection, preparation, and the development of an AI system to comprehend house prices, it is evident that the process can take several weeks or even months to complete. This is particularly true when considering that, despite the project being evaluated at a few tens of FPs, the complexity of the work may be disproportionate to this measure. For example, if historical data is difficult to obtain or requires significant cleaning and transformation, this may take longer than anticipated. Similarly, if the AI model to be developed is particularly complex or requires numerous tests and iterations for optimization, the required time may exceed expectations for a project evaluated at a few tens of FPs.

Furthermore, despite the existing categories of the SNAP metric being applicable in measurement, they may not be sufficient to fully capture the complexity and specific challenges of a project of this nature. The innovative and multidisciplinary nature of creating an AI system requires particular attention to a wide range of factors, which may not be fully represented by existing metrics. Therefore, it is important to carefully assess the project's complexity and also consider other measures and methodologies to ensure an accurate and comprehensive evaluation of the work done.

In conclusion, we add that:

The analysis of software metrics methodologies and the progress of AI highlight several aspects to consider.

Firstly, the importance of data and their initial processing emerges as a key element in evaluating the effectiveness of AI-related software. This shifts the traditional approach, pushing to consider not only the functionalities offered to end users but also the quality and correctness of the data used.

In addition to data, several other factors influence the evaluation of AI software. For example, the underlying technical complexity, the interpretability of AI solutions, and the confidence in them, are critical elements that require particular attention. Equally important are the reliability, scalability, and security of the system, along with update management and compliance with ethical standards.

Effective evaluation of AI software thus requires a multifactorial approach. For example, consider various types of AI that require evaluation:

• In the medical field, an Al-based diagnostic system could be evaluated based on its accuracy in diagnoses and its ability to interpret results.

- In the financial sector, an automatic trading algorithm could be measured based on its ability to generate profits in different market conditions.
- In the manufacturing industry, an Al-based quality control system could be evaluated based on its accuracy in detecting defects in products.

These examples illustrate how the evaluation of AI software is varied and requires a specific approach for each application.

"One size doesn't fit all:" functional measurement is important but must be complemented with non-functional measurement. And IFPUG SNAP can be the solution to improve project estimates by adding the measurability of aspects that FPA cannot measure by its nature.

I wish to express my gratitude to Fabio Papagno, Luigi Buglione, Daniele Zottarel, Marcello Sgamma, and Fabrizio Di Cola for their valued and kind contribution to this article.

### ABOUT THE AUTHOR



**Tetyana Komarova** (Rome, Italy) has more than 25 years of experience in IT. She is a CFPS since 2015 and is certified in CSP (SNAP) since 2020.

Tetyana is the SW developer, analyst and metrics expert at NTT Data Italia, a multinational company focused on Innovative IT solutions. She is in charge of Verification service for estimates and counts; consulting service for the preparation of estimates and counts.

Working in foreign countries and collaborating with different professionals, she has learned to easily relate to people of different nationalities and cultures, interpreting and adapting communication and requests to different personal, religious and cultural sensitivities. She is passionate about the world of behavioral economics.

### FEATURE ARTICLE

# Agile Planning and Monitoring WITH KANBAN AND MEASUREMENT

#### By: Carlos Simões and Thiago Silva da Conceição

#### Abstract

 he first step in planning the fulfillment of business needs related to software development is understanding the organization's productive capacity, that is, its IT workforce needs. Workforce outsourcing is increasingly a strategic choice, facilitating innovation, flexibility,

efficiency in the execution of processes, meeting peaks in internal or external demand and eliminating fixed costs of production capacity. The strategy of partitioning business needs into small evolutions or new developments and distributing to the outsourced workforce, as well as measurement analysis facilitates agile planning and monitoring, and the adoption of a development method such as Kanban. The management of the service level agreement between contractor and supplier includes evaluating the performance and quality of services performed by the outsourced workforce. We present a measurementsupported method that helps organizations to quickly plan and monitor software development by adopting Kanban. With this, it is possible to define and monitor the prioritization, performance, and quality of software development and maintenance demands, as success factors for good organizational performance.

#### **1. Introduction**

The demands that arise in daily life require planning to fit the organization's production capacity. In addition, the chance of planning errors due to the need to redo tasks that initially seemed simple generates exponential loss of time and productivity [Neves 2019].

According to Neves [Neves 2019], after some time adopting the Scrum framework, it was noticed that when there is a frequent occurrence of unplanned urgent requests, it may be necessary to reallocate team members to meet these demands during the execution of iteration tasks (in Scrum, called a sprint).

To avoid compromising the sprint goal, some actions can be established, such as adding extra hours to the planning to work on additional demands. However, it is noticed that this can cause great difficulty in sprint planning and team allocation [Neves 2019].

The first step in planning the organization's production capacity is understanding the need for workforce [Ribeiro et al. 2009], which is directly related to the functional sizing of business needs to be met; that is, the backlog of functionality. Having the assistance of an external supplier with specialized professionals, adequate technological infrastructure, and extensive market experience can be the difference to meeting demands, as well as to keep organizational knowledge updated.

The planning and management of production capacity require a standardized and auditable way of measuring task accomplishment. Breaking down a business need into small pieces (task granularity) facilitates planning and helps reduce the number of defects found by the client [Simões and Montoni 2014]. It also facilitates distribution to the development team, which executes them in a continuous, agile, and rapid delivery flow, suitable for the Kanban method.

The use of outsourced IT workforce is a strategic option with the aim of meeting peaks in internal or external demand, allowing organizations to eliminate fixed costs of production capacity for their services during periods of low demand. In addition, outsourcing provides:

- cost reduction in infrastructure; and
- reduced effort of human resource management due to the low cost of managing the workforce outsourcing contract, which is due to the lower complexity of drafting and monitoring a workforce outsourcing contract compared to managing internal staff.

The more mature the organization, the more it understands its own outsourcing maturity level to align with strategic business functions and improve the efficiency and effectiveness of outsourcing [Ahmad et al. 2017; Garcia et al. 2013; Ribeiro et al. 2009].

Outsourcing has advantages such as speed in acquiring specialized skills to address the shortage of internal staff, reducing the time to find and train professionals, and ease of allocating professionals to meet temporary demands, as well as introducing changes in corporate culture through innovations [Murugesan 2020]. However, it presents challenges and barriers relevant to the IT workforce outsourcing business. These include: performance and quality in service delivery by the outsourced workforce being below the desired level. Producing software with performance and quality problems, which will significantly affect user satisfaction and total costs to meet business needs [França et al. 2020]; difficulty in developing skills for the workforce [LEI 8.666 1993]; difficulty in finding qualified personnel in sufficient quantity for the salaries offered [LEI 13467 2017].

This article aims to present an agile and iterative planning and monitoring method supported by Kanban practices and functional sizing of business needs. The planning should cover the entire software development lifecycle, from planning to solution delivery, including performance evaluation and service quality. In addition to the introduction, the need to understand the organization's production capacity (Section 2), a literature review on the Kanban method (Section 3), agile planning (Section 4), performance and quality monitoring information (Section 5), and conclusions (Section 6) are also presented.

#### 2. Organization Productive Capacity

One of the greatest difficulties in capacity planning and management and in software development and maintenance projects is knowing the extent of what is being managed [Ribeiro et al. 2009]. Many applications that initially seem small, during development, often turn out to be much larger than initially anticipated, and in some cases, they become so complex and large that control is lost. Additionally, it is not always feasible to embark on the adventure of developing an application, as there are currently countless ready-made products on the market or requiring minor customizations [Simões 2004].

The increase in service demand, rapid technological change, and the diversity of business needs make it difficult to stay updated on the best IT solutions quickly, with quality and quantity of workforce that can hardly be met by the internal team. A strategic alternative is to rely on the assistance of an outsourced workforce supplier.

In software development management, there are success factors such as having measurable information about the skills, competence, and performance of the workforce; avoiding complete responsibility for planning and monitoring the performance and quality of services provided by third parties; understanding the organization's production capacity; having a budget that considers established productivity and effectively achieved productivity, associated with quality and performance indicators defined in a service level agreement [Simões 2023].

#### 3. The Kanban Method

Increasing the quality of software development is considered a factor for success, as it significantly helps in achieving the organization's quality and performance objectives (productivity estimate accuracy and reduction of defects found by the customer). According to Simões and Montoni [Simões and Montoni 2014], the strategy of dividing business needs into small evolutions and distributing them to the workforce provides greater ease in estimating and controlling production capacity. In addition, in small evolutions, the early detection of defects helps improve product quality and consequently reduce the number of defects found by the customer in acceptance testing [Simões and Montoni 2014].

The Kanban method emerged in Japan with the Toyota Production System to control automobile manufacturing. Unlike other methods, demand dictates the pace of production, causing the industry to adapt its production speed according to the level of customer consumption [EQUIPE TOTVS 2022]. Workflow planning and management require a way to measure and control task completion and work item inputs. The flow according to performance levels and the size of the work to be done represents the time for a work item from its entry into the workflow to its exit.

A simplified Kanban workflow to signal the progress of iterations can initially be seen through three states. The TODO state represents tasks eligible for execution. The DOING state represents tasks in progress. Finally, the DONE state represents completed tasks. Depending on the maturity level of the organization's software development processes, these states can be decomposed into new activities.

#### 4. Agile Planning and Monitoring

One of the biggest problems in planning and monitoring system development is completing projects with quality, within the expected deadlines and budgets. Having knowledge of functional needs and dimensioning of what needs to be produced undoubtedly increases the success of managing and successfully completing software products [WOLFART 2012].

When adopting an outsourced workforce, it is crucial for success to avoid having the planning, monitoring, and execution of IT services completely under the responsibility of a single supplier.

The adoption of a functional size estimation method allows for obtaining a historical measurement base to support the team in effort estimation, which, when combined with established prioritization, allows the team to plan, monitor flow, and distribute work, enabling the implementation of Kanban. The Function Point Analysis method supports the definition of productivity, for example, in hours per function point, which, when associated with the functional size measured in function points [IFPUG 2010: BNB 2010], allows for the calculation of necessary effort estimation.

The adoption of a functional size estimation method, defined by a globally recognized organization such as the International Function Point User Group (IFPUG), not only significantly reduces the effort of implementing a method but also allows for the comparison of information resulting from applying the method with those of other organizations.

Having access to an agile mechanism that uses an estimation method and supports the team in planning, replanning,

prioritization, and monitoring of their work according to performance levels, functional dimension, and effort required is a key factor for success.

This mechanism should be easily understood and agile enough to allow for replanning demand execution and team performance monitoring. Additionally, it should support measurement collection to feed a historical performance and quality base. For this purpose, it is essential that measurements are characterized based on information such as team profile and experience, processes and artifacts used, the programming language, among other characteristics. Furthermore, each measurement collection should be uniquely and chronologically identified.

Many applications that initially seem small, during development, often turn out to be much larger than initially anticipated, and in some cases, they become so complex and large that control is lost.

The combination of functional size information for each backlog item with the historical measurement base, translated into effort hours for development, will allow the team to obtain fundamental information for planning and prioritizing backlog item execution. This way, each component of the Kanban team can decide which backlog item will be their responsibility, even estimating the initial and final dates for the activity. This information will be crucial for monitoring team performance and making adjustments based on root cause analysis.

Planning based on detailed functional size would require considerable knowledge of the backlog items before starting system development or maintenance, which is not appropriate for agile development. It would be more suitable to establish effort planning based on an initial backlog that can evolve throughout the development period, prioritizing business needs. In the end, a certain total functional size will be delivered, rather than closing the scope. It is common in these cases for estimates to be updated as the initial backlog evolves and new knowledge about business needs is acquired.

The planning, replanning, and monitoring mechanism for backlog items should also support their prioritization based on corresponding criteria and weights, such as the relative importance of the item from a business perspective, the benefit of adding it to the software first, and the penalty if it is not added now, considering the technical dependency between backlog items. The business value, which is the basis for prioritization, is calculated based on the assigned weights for each criterion. This

prioritization provides input for the Kanban team to decide the order of backlog item execution.

It is possible to use other estimation methods, such as User Story Points. However, this requires prior effort to make the estimation method standardized, repeatable, and auditable, per the guidelines in NBR ISO/IEC 14143-1, which defines the fundamental concept of Functional Size Measurement (FSM).

User Story Points do not follow a set of consensus guidelines, so each organization must define its set of guidelines. It is a dimensioning of the complexity of the set of functionalities requested and received by the user, not an effort estimate. The complexity is agreed upon by the development team members, taking into account previously established criteria. It is not an effort measurement in terms of development hours but a functional size measurement.

Being a dimensioning of the complexity of the business need, the functional size measurement is independent of the development method to be adopted. The level of knowledge the team has about the business need represented in the User Story does not make it simpler or more complex. Therefore, the level of knowledge about the business and the environment in which the User Story will be implemented does not influence the complexity of the business; it influences the time (hours) required for implementation (team's historical productivity). The User Story is the beginning of the dialogue between the user and the development team. The information necessary to fully understand the customer's needs is not always present.

This understanding is matured throughout the agile development cycle, adding rules and business requirements that had not initially been addressed and adding value to the client's business. New estimates of functional size and effort may be necessary to adjust the initially established estimates.

User Story Point, as it is a complexity sizing unit reflected in functional size, cannot be used alone to estimate effort, productivity, quality, costs, deadline and resources for the project. The effort estimate (hours to perform an activity expressed in terms of person hours (PH) and a relationship between the complexity (functional size expressed in user story points (USP) and the productivity (PROD) estimated to perform the activity (expressed in person hours per user story point). Therefore, the calculation would be PH = USP \* PROD. The Fibonacci Scale can be used to assign a relative value representing the complexity of a User Story. This scale starts with the numbers 1 and 2; subsequent values are determined by summing the previous two (1, 2, 3, 5, 8, 13, 21, 34, 55, ...). A value greater than 21 may indicate that the HU is complex and should be better understood. It may also be an Epic in need of being divided into two or more User Stories.

A standard of granularity of the user story being analyzed must be taken into account. Criteria must be defined for the User Story and to establish its complexity. These definitions are success factors for the adoption, institutionalization, and audit of the application of the method in the organization. Furthermore, everyone involved in the method must be trained, so that it can be used to establish the functional size and calculate the effort required to complete the work. As it is a relative scale established by the organization itself, it is not possible to compare it with other organizations. Nor was the scale established by an international organization.

#### 4.1. Measurement Method

It is not possible to effectively measure the functional size of a business need without using a standardized, repeatable, and auditable measurement method. The absence of such a method hinders the generation of consistent measurement information to be used in the effective management of software development. Standard NBR ISO/IEC 14143-1 [NBR ISO/IEC 2012] ensures that all functional measurement methods are based on similar concepts and in the expected form for the method, depending on the functional domains to which they apply. This standard does not provide detailed rules on how to:

- measure the Functional Size of software using a specific method,
- use the result obtained from a specific method, and
- choose a specific method.

The standard NBR ISO/IEC 14143-1 [ISO14143 2012] classifies user requirements into two subsets: User Functional Requirements and User Non-Functional Requirements. It is not possible to measure the functional size without having a minimum and necessary knowledge of the business need, compatible with the adopted measurement method. Therefore, it is not advisable to estimate the functional size without a minimally acceptable knowledge of the business requirements.

When starting the definition or use of a standard measurement method, the first step should be to establish the granularity of the functional requirement, which:

- must be written in the user's own language,
- is historically primary and is not related to technology,
- must be understood by both users and developers,
- has a description and granularity that are compatible with the criteria established for the adopted measurement method,
- defines procedures to validate whether the necessary business requirements have been identified.

The Function Point Analysis method [IFPUG 2010; BNB 2010] defines criteria for estimating the functional size of a business need delivered to the user in terms of function points. This

definition follows the one established in the standard NBR ISO/ IEC 14143-1 [NBR ISO/IEC 2012]. This method is linear, scalable, comparable, and auditable, and can be applied both in the initial phases and at any stage of the software lifecycle. When starting to use this method, it is essential to understand the concept of granularity of a business requirement in terms of an elementary process, which:

- represents a business need,
- is the smallest significant functional unit for the user,
- recognized by the users as the functional unit and meets a functional requirement,
- constitutes a complete, independent transaction and is not related to technology.
- it cannot be divided or decomposed without leaving the business in a broken state,
- satisfies the functional requirement,
- leaves the business processes it is being counted in a consistent state; no preliminary or subsequent processing steps are necessary to initiate or complete the functional requirement,
- as an elementary process for business reasons, cannot be divided,
- has a complexity associated with the amount of information involved,
- must be associated with the storage or retrieval of information recognized by the user.
- has business transactional functions (inputs, outputs, queries, etc.) that meet the definition requirements of an elementary process.

When analyzing business needs, attention should be given to the concept of uniqueness of an elementary process, which is considered unique if all three criteria below apply:

- the types of identified data elements are the same,
- the referenced internal and/or external data group are the same,
- the processing logic is the same (requirements specifically requested by the user to complete an elementary process, such as validations, algorithms or calculations, and reading or maintenance of a data function).

In an improvement project, an elementary process is considered changed if at least one of the following two conditions is met:

• one or more processing logic is changed,

• one or more DETs of the transaction are changed.

According to the standard NBR ISO/IEC 14143-1 [NBR ISO/IEC 2012], user requirements can be classified into two subsets:

- User Functional Requirements are the business needs requested by the user that are subject to functional sizing according to the criteria defined by the Function Point Analysis (FPA) method for business transactional functions and data functions related to software products. That is, sizing the creation, modification, or deletion of software product functionalities, applicable throughout the software development cycle measurement activities, such as project and quality management, requirements analysis, functional and technical analysis, coding and unit testing, system and integrated testing, user acceptance testing and installation.
- User Non-Functional Requirements are not subject to the concepts and criteria established for functional sizing by function point methods. Non-Measurable Objects are components or activities related to software development whose main objective is not to create or alter a functional business need requested by the user of a system. Therefore, it does not involve the creation or modification of functional objects or data according to the FPA method standard. Examples of tasks not measurable in function points: cosmetic changes, performance upgrade, package version upgrade, data migration/population/fixing, user training, pure technology design, software project reengineering, among others.

For estimates of items that cannot be measured by function points, it is possible to estimate effort in person-hours or to define, classify, and parameterize these items according to organizational needs, making an equivalence in function points or establishing effort in person-hours.

It is good practice to define standardized procedures to handle these cases and generate a measurement base to be used, allowing for the repeatability of estimates. For example, it can be established that code data and the functions that maintain it, which are not classified as measurable objects in Function Point Analysis, can be measured as 1.5 FP for the code data table and 1.5 FP for the maintaining functions [SISP 2021].

### 4.2. Effort Estimation in Business Needs Planning and Monitoring

The Kanban team, when analyzing the backlog items, can make effort estimations for the relevant items, considering their classification as measurable or non-measurable objects. Even when the business needs are not fully understood and defined, it is possible to make an initial effort estimation. Throughout the development cycle, for example, if Kanban is adopted, it is possible to redo the effort estimations and replan the execution

of activities. A planning and monitoring model should be agile enough to allow for rapid replanning of the needs.

For items related to measurable objects using the adopted functional size estimation method, the team classifies each object according to the method's criteria, establishes the functional size, and uses a historical database to support the calculations of the effort required to carry out the activity. This information, as well as the calculations, is recorded with the aim of later feedback for the historical database.

For items related to non-measurable objects using the adopted functional size estimation method, the team classifies each nonmeasurable object according to the organization's established criteria and estimates the effort required to carry out the activity. This information, as well as the calculations, is recorded with the aim of later feedback for the historical database.

With the obtained effort estimation and prioritization according to established criteria, the team will have the means to establish deadlines for completing backlog items, prioritize or revise prioritization, and, if applicable, assign team members to carry out the activities.

#### 4.3. Deadline Estimation in Business Need Planning

The deadline for the development of the business need can be obtained through various ways, such as:

• A regulatory/normative/legal/operational need with a fixed date to come into effect, for example, a new law that will come into effect on a certain date and the system needs to be operational by this date. In this case, one must estimate the functional size of the initial backlog, obtain the established productivity, the deadline for the completion of the backlog, and through the combination of these elements, one can calculate the size of the team needed to complete the backlog within the established deadline, as exemplified in Table 1.

#### Table 1 - Information for planning

TYPE OF INFORMATION	VALUE
Required production date	05/30/2024
Business need backlog size	100 Function Point
Established productivity	10 Person Hour/FP
Full effort for development	1000 Person Hour
Number of working hours available from the start of development until the end date	500 Person Hour
Size of the team with a multidisciplinary profile, calculated from the combination of previous information	2

Therefore, for a desired date, productivity, and with a previously established functional size, it is possible, with a team of two people with a multidisciplinary profile, to develop a set of functional requirements with a total functional size of 100 function points within the desired deadline.

• The backlog of a business need was initially estimated with a certain functional size. Based on the team size, the amount of daily working hours of the team, and the established productivity, it is possible to establish the deadline for the completion of the backlog, as exemplified in Table 2.

#### Table 2 - Information for planning

TYPE OF INFORMATION	VALUE				
Business need backlog size	120 Function Point				
Team size with multidisciplinary profile	5				
Number of hours of daily work of the team	40				
Established productivity	10 Person Hour/FP				
Deadline in days for completion of development	30 work days				

Therefore, with a functional size, productivity, and a team of five people with previously established multidisciplinary profiles, it is possible to develop a set of functional requirements with a total functional size of 120 function points within the desired timeframe of 30 days.

• The business area has a certain budget for a certain period to invest in the development of a business need. By associating the available working hours with the desired timeframe, it is possible to define the size of the team and the amount of functional size for the period in question, as exemplified in Table 3.

#### Table 3 - Information for planning

TYPE OF INFORMATION	VALUE
Budget available	R\$ 640,000.00
Hourly rate	100.00 R\$/PH
Number of person hours available	6.400 Hours
Defined desired deadline	10 Months
Number of person hours available per month	640
Number of hours per person per month	160
Team size with multidisciplinary profile	4
Established productivity: person hours per FP	10
Business need, function point backlog size	640

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The parameters in Table 3 reflect the values needed to create a system with the functional size of 640 function points. The budget, productivity, hourly rate, and number of function points are assumed fixed.

#### 4.4. Historical Record of Business Need Fulfillment

Throughout the completion of backlog items, it is essential that the Kanban team records information related to the progress of the work, not only for monitoring and possible replanning reasons, but also to feed a historical base of fundamental information to support new software developments.

Recording the number of hours worked on the backlog item and the number of nonconformities identified in quality verification tests are essential for monitoring the performance and quality of development, in addition to making it possible to act proactively on the cause and make it possible to correct problems before they are activities closed. These records can be used to create performance and quality indicators and graphs, as presented in Table 4.

The recording of hours performed must be compatible with the maturity level of the organization's processes. You can record the total number of hours to carry out activities or record the number of hours to carry out each of the activities considered critical for the organization. For example, you can record time taken for the activities of Describing User Stories, Implementing User Stories and Testing User Stories. You can also include records of the number of non-conformities identified in the quality checks and validations of the software products that were developed.

### **4.5. Consolidation of Information Used for Planning and Monitoring Backlog Items**

Table 4 presents a summary of the information that is involved in planning and monitoring backlog items, as presented previously.

Table 4 - Planning and monitoring information forbacklog items

#### Backlog item identification

Item description

Team profile characterization

Language characterization

Adopted process characterization

Responsible

Initial date

Final date

Status: TODO / DOING / DONE / IMPEDIMENT

Type of Object: According to the estimation method adopted (Example, being FPA: EE / SE / CS / ALI / AIE)

Functional size: for objects measurable by the estimation method adopted

Prioritization criteria: Relative importance / Benefit to add first to the SW / Penalty if not added now

Business value

Execution sequence

Operation type: Insert; Update; Delete

Estimated number of hours (according to the estimation method adopted)

Non-measurable object type

Estimated number of hours (for objects not measurable by the estimation method adopted)

Achievement progress rate percentage

Number of hours worked to date

Number of non-conformities identified in quality verification tests

Number of non-conformities identified in quality validation tests

Depending on the degree and maturity of the organization's processes, other information may be necessary. Organizations that control critical subprocesses may need information related to planning, monitoring and carrying out activities, such as, recording planned and performed time for the activities of Describing User Stories, Implementing User Stories and Testing User Stories.

#### 5. Performance and Quality Monitoring

The IT department of the majority of companies usually only tracks past costs of hardware, software, and peopleware (the cost of human resources involved), as well as some indicators related to the production environment (processor utilization over time, system availability rate, among others). The absence of performance and quality indicators in the execution of tasks that reflect the development of information systems hinders the effective management of these activities. Producing high-quality services with the minimum possible cost— in other words, high productivity—is a critical success factor for good business performance [Simões 2004].

The existence of performance and quality graphs as presented in Figures 1, 2, 3, and 4, generated from the recorded and calculated information described above, simplifies the planning and monitoring of the backlog. Figure 1 shows the comparison between the estimated hours for each Functional Requirement according to the adopted method and the actual hours performed by the development team responsible for completing the requirement.





In Figure 2, a comparison is shown for each Functional Requirement between the estimated number of hours by the adopted method, the actual number of hours performed by the development team responsible for the requirement up to a certain point, and the total projected hours to be completed (estimated completion) based on the percentage of progress reported by the team.



#### Figure 2 - Forecast for completion

In Figure 3, the comparison between the productivity in terms of person hours per function point achieved by the team for the complete development of each measurable user story or functional requirement, and the control limits (upper, base, and lower) calculated using statistical techniques, is presented. It can be observed from the graph that the performance achieved in the requirement development, i.e., the actual productivity, is within the established limits.

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Qualit	y - Defec	t Density	identifie	d in Syste	em Test- D	DDST/FP						•	Actual	_	UCL		—CL	LCL	
10.0 9,0	8 <u>.7</u>		9,0	9,3 ●		8,0	8,4												
8,0 7,0 6,0	-					•													
5.0 4,0 —								121											
	001	002	003	004	500	8 Functi	6 onal Rec	8 quirement	600 s	010	011	012	013	014	015	016	017		

Figure 3 - Performance and control limits

In Figure 4, for each of the user stories or Functional Requirements classified as measurable objects by function point, which have already been developed and tested by the team, that is, software development quality evaluation (verification), a comparison is shown between the density of defects identified in systems testing in terms of DDQA/FP and the control limits (upper, base, and lower) calculated using statistical techniques. It can be observed from the graph that the QA defect density identified in requirement development is within the established limits.



#### Figure 4 - Quality and control limits

For organizations that control critical subprocesses and record the performance and quality information of these subprocesses, it is possible to generate control limit charts for each of the critical subprocesses.

#### 6. Conclusion

This article proposes a method for organizations to plan and monitor software development in an agile manner using Kanban and supported by measurement. In addition, it enables the tracking of team performance and quality during the completion of activities. With this, it is possible to define and monitor prioritization, performance, and quality of software development and maintenance, which is a success factor for good organizational performance.

Workforce outsourcing is increasingly becoming a strategic choice, facilitating innovation, flexibility, effectiveness in process execution, and meeting internal or external demand peaks. This approach allows organizations to eliminate fixed costs of productive capacity of their services during periods of low demand, which would impact profitability. The use of outsourced IT workforce is a great alternative to meet seasonal or nonseasonal business needs, and the Kanban method fits well with this practice. However, it is a success factor to avoid having the planning, monitoring, and execution of services performed by the outsourced IT workforce entirely under the responsibility of a single supplier. The model uses concepts from the Function Point Estimation method, but it can be adapted to other estimation methods, such as User Story Points. However, this requires prior effort to standardize, repeat, and audit the estimation method, compatible with the standard recommended in the NBR ISO/IEC 14143-1 [NBR ISO/IEC 2012]. Additionally, all those involved in the defined method must be trained in order to use it for functional size estimation and effort calculation needed for the work. Since it is a standardization established by the organization itself, it is not possible to compare it with other organizations in lieu of international standards.

Recording a set of planning, monitoring, and completion information for the backlog items is essential to track the performance and quality of development, as well as to proactively address the root causes and correct issues before the activities are completed. These records can be used to develop performance and quality indicators and graphs, as well as to feed a historical measurement database that is fundamental for effective software development management.

### **AGILE PLANNING AND MONITORING**

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#### **ABOUT THE AUTHORS**

**Carlos Simões** has a PHD from the Federal University of the State of Rio de Janeiro and a Master's in Systems Engineering and Computing from COPPE/UFRJ. He is a Consultant for PMO, Agile Methods, Project Management, and Metrics for the Enel group in Brazil.

**Thiago Conceição** has more than 10 years of experience in IT and Business as well as expertise in agile methods, cybersecurity, growth hacking, strategy, technology, digital, coaching, and training. With a multidisciplinary background, he has applied his IT and business skills in various sectors. He holds 15+ international certifications in various domains, including Software Measurement. A member of IFPUG since 2009, and having passed the rigorous CFPS exam several times, he became a member of the CEC, PEC, and CMC committees where he contributed broadly to the IT community in several ways, such as helping organize webinars and the ISMA conference, evaluating the work of others submitted to IFPUG, and translating SNAP manuals and tools.



# **ENGAGING THE C-SUITE** ABOUT THE VALUE OF FUNCTIONAL MEASUREMENT

#### By: Joe Schofield

#### Abstract

he significance of C-suite level discussions regarding Function Points as a basis of estimation within IFPUG has persisted since the 1990s. The anticipated benefits behind the frequently resurfacing importance of penetrating the C-suite haven't changed. A primary benefit is IT leadership's credibility in formulated product delivery dates that are often taken as promises by the business. Another benefit is the enhanced confidence in the other estimates—cost and scope of work—often associated with software development. While the opportunity persists for the IFPUG community to demonstrate its value with reliable estimates, not all organizations have the same priorities—other more pressing needs for Al and cybersecurity may have surpassed the product development assurances of the past.

**What is the C-suite?** The C-suite is generally recognized as the leadership team responsible for the direction and operation of the institution for which it serves. This role within what would become to be known as the "C-suite," had its genesis in the early 1900s with the CEO. It wasn't until the 1980s that the

supporting roles of the Chief Information, Operating, Financial, and Marketing Officers (CIO, COO, CFO, CMO) were created.<sup>1</sup> The Chief Technology Officer (CTO) and Chief Human Resource Officer (CHRO) followed quickly thereafter. Today the number of Chief fill-in-the-blank Officers continues to increase. The state of Arizona recently introduced its Chief Heat Officer<sup>2</sup>, while McKinsey & Company reported a one-third drop in companies that had a COO between 2000 and 2018.<sup>3</sup>

What's on the minds of those C-suite leaders? Other than when prompted by software consulting firms, or the consulting "arms" of larger IT or management consulting organizations, Function Points are not typically on the minds of C-suite leadership. Functional and non-functional measurement are not on the minds of C-suite leadership. ISO standards and benchmarking are not on the minds of C-suite leadership. What then is consuming their available cycles? Often, it's their forthcoming presentation to the Board of Directors with conversations on: EBDITA,<sup>4</sup> stock valuations, progress on the new data center, resolving the latest cyber-attack (much of which occurs outside the public's viewing), Al exploitation, innovation, staffing and budgeting, and pending legal affairs. A cursory examination of cybersecurity regulatory legislation alone suggests the need for C-level attention. Only acronyms are used here for brevity—see the cited sources for a fuller definition of the acronyms referenced:

SOURCE	REGULATORY NOTICES
Europe	CSIRTs/CERTs, ECSO, EE – ISACs, ENISA/EU Agency for Cybersecurity, ENISA, JRC, NIS Directive <sup>5</sup>
India	IT Act, DPDPA <sup>6</sup>
Brazil, Argentina, Chile, Columbia, and Mexico	share similar regulations <sup>7</sup>
Australia	Privacy Act, SOCI Act, Corporations Act, and the Freedom of Information Act <sup>8</sup>
US	CISA, HIPAA, GLBA, PCI DSS, EOINC <sup>9</sup>

In addition to cyber concerns, advancing the "return to the office" is consuming precious cycles. Even Zoom is requiring their staff to return to the office—ironic for a company that thrived from the shift to remote work in the early days of the pandemic.<sup>10</sup> Even cloud computing seems to have given way to AI integration and transformation.

McKinsey & Company offers a slightly different perspective on leadership priorities including:<sup>11</sup>

- digital transformation,
- navigating the future of work, (post pandemic work, where, how, how much, are typical topics), and lastly,
- the supply chain.

Note that while installed software or SaaS may be the engine to drive many of these C-suite needs, software size and measurement is absent from the list of C-suite imperatives. The COO may perk up when software efficiency gains are mentioned. The CFO may pay attention when better software estimates translate to mitigated portfolio risk. The CIO is the most likely to relate to the impact of platform consolidations or blockchain usage. Others less directly responsible for technology, the CMO and CHRO will likely be doodling or glancing at their companyissued cell phones whenever the conversation drifts towards the deployment of technology.

Another option for reaching the C-suite is to publish articles that target their interests. Interested in influencing the CIO? Why not submit worthy articles to CIO Magazine? Of their top five articles early in 2024, two dealt with AI, one with culture, and two with social topics.<sup>12</sup> Discussions related to technical aspects

of software seem scarce. A second article prioritizing CIO focus areas for 2024 is a little more hopeful with topics around value and costs as well as: data (2) and cyber security, AI (2), talent (2), and balancing innovation and operational excellence.<sup>13</sup>

Charly Paelinck<sup>14</sup> has served in CIO and Senior Executive roles for more than 30 years in an array of international industries including healthcare, telecom, hospitality, food and beverage, and RFID-enabled table games solutions. Recently he described his three most pressing objectives:<sup>15</sup>

- 1. organizational efficiency utilizing repeatable processes,
- 2. strategic corporate initiatives (innovation), and
- 3. addressing near-term equipment obsolescence

An argument can be made that functional measurement could help drive software efficiency advances, but his corporation doesn't develop their own software. Perhaps a different argument can be made that software sizing metrics can be used to assess the number of features and the value of software delivered. At least in Charly's case, he's focused on more urgent business needs. Tangentially, the benefits of function measurement might accelerate his path, but connecting the dots to make that case would likely be fraught with distractions and competing priorities of the business.

Agile's popularity—and familiarity at the C-suite level—may also present an opportunity for discussion around software measurement.

Encouraging insights: Mauricio Aguiar, a two-time IFPUG Board President, recalls his earliest IFPUG Board meetings in 2000. His new colleagues shared the crucial need for fellow members to get into the "hearts and minds of CEOs and CIOs."<sup>16</sup> This calling was more likely a message from Mauricio that had resurfaced within the Board. This theme has become a recurring mantra of sorts within the IFPUG community, its Board, and Committees. In 2008, the Gartner Group published an article endorsing the use of Function Points for software development contracting.<sup>17</sup> The benefits of functional size as a basis for comparison then, both for contracted and internal make vs. buy options, and as a common denominator for productivity, cost, defect estimation, and metrics are readily apparent for those managing the work. Unfortunately, those benefits can become obscure when percolated up through the leadership ranks. Thus, for Functional Measurement (and non-Functional) enthusiasts to engage directly with members of the C-suite, can be rare, elusive and fleeting.

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Agile's popularity—and familiarity at the C-suite level—may also present an opportunity for discussion around software measurement. As an example, functional measurement can quantify the size of sprint deliverables or at a broader scale, releases. In turn, those values can help to assess productivity, overall progress, and cost-to-value performance. As that topic begins to sway more towards traditional project management, it may have detrimental effects on an agile transition.

A related prospect may by manifested in the need to engage leadership in competitive contract bidding. Using Function Points in a pricing model, Christine Green, another former IFPUG Board President, describes the direct interaction with executives across four European nations. Christine cites C-suite level leadership within the European Union (eu-LISA), Poland, and NATO participation in the use of Function Points for software pricing.<sup>18</sup> And in the public sector, functional measurement is a required component of contract negotiation in Europe, Asia, and South America.<sup>19</sup> While not directly related to the C-suite but rather the global management of software development, the United States' GAO (Government Accountability Office) recently updated its Agile Assessment Guide: Best Practices for Adoption and Implementation. It recognized and endorsed IFPUG Simple Function Points as a best practice for software cost estimation.<sup>20</sup> Thematically emerging then, is the use of functional measurement in contract negotiation when legislatively required or encouraged, for the affected "jurisdictions."

The impact of software measurement is apparent and central to the success in some of the preceding examples, especially for estimation and pricing in the contracting of services. However, the benefits are not always obvious. Instances when the C-suites is penetrated and engaged may be similar to the fisherman who hooked his/her first marlin,<sup>21</sup> can leave the pursuer exclaiming "Great! Now what?"

**I've navigated my way into the C-suite, now what?** Like a fisherman that hooks a Jonah-sized fish, lesser experienced measurement consultants are likely ill-equipped to connect the dots between value and functional measurement with the C-suite. Understanding the variety of topics on the minds of the C-suite and being able to quickly respond from a measurement perspective requires wisdom, insight, and sometimes luck. David Herron is a longtime active IFPUG member, co-founder of the David Consulting Group. As an internationally recognized function point and measurement advocate, and more recently a proponent of value metrics, he has engaged frequently and directly with CIOs and C-suite officers. During those executive leadership encounters he found success following three fundamentals: <sup>22</sup>

- 1. Focus on the relationship, it is always about the relationship.
- 2. Demonstrate that we understand what is important to them and what business problems they are trying to solve.
- 3. Seldom talk about Function Points when discussing performance measures with the CIO, instead talk about size; discussing FPs in detail is of little interest to them. They accept that FPs are an accepted sizing measure.

David's sage suggestions remind us to listen and understand before trying to close a sale on a pre-determined solution. Software measurement is not an elixir for all of the needs of an organization. Diagnosing a patient's symptoms necessarily precedes a prescription for wellness. Helping the C-suite begins with establishing and cultivating trust by diagnosing their needs which builds support moving forward. Identify, connect, enhance might be an over-simplification of a value-based C-suite engagement. We may not always be able to easily measure success from the C-suite engagement.

# THE VALUE OF FUNCTIONAL MEASUREMENT

Granted, the colleagues polled for their insights in this article were not random, nor was the poll anywhere near exhaustive. It was not based on a survey; it is not statistically relevant. Neither are your own experiences. This article is merely a sampling of ideas to stimulate the thoughts and furtherance of a longstanding desire to access and influence organizational leadership regarding software measurement. Keep your elevator speech simple but focused on the need of the C-suite. That may require some upfront preparation; just saying.

In gratitude: I extend my appreciation to my colleagues mentioned in this article for their helpful thoughts and feedback: Mauricio Aguiar, Charly Paelinck, Christine Green, and David Herron.

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 $^{4}\,\mbox{EBITDA:}$  earnings before interest, taxes, depreciation, and amortization

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#### **ABOUT THE AUTHOR**



**Joe Schofield** SCT, SCAC, SSMC, SSPOC, SMC, SPOC, SDC, SAMC, CSQA, CSMS, SA

Independent Consultant – Enabling Organizational Capability Scrum Certified Trainer | Certified Agile Coach | Certified SAFe<sup>®</sup> 5.0 Agilist

Past President, International Function Point Users Group 2023 National Champion; Powerlifting America; 74kg, Master IV 2022 National Champion; USA Powerlifting ; 75kg, Masters IV



## **EVALUATION OF THE AUTOMATED TESTING APPLICATION FUNCTIONAL SIZE WITH IFPUG FUNCTION POINT ANALYSIS**

#### By: Maurizio Polidori

#### Introduction



n software engineering, to ensure the quality of software it is important to regularly test. This paper presents the activity of automatically testing individual parts of a software program, which is commonly named as "automated testing." Similarly, "part of

a software program" identifies a component of a program with autonomous functioning. For example, depending on the programming paradigm or programming language, this component corresponds to a single function in procedural programming, or a single class or a single method in object programming.

When developing a project for an automated testing application, as for any other application, the following steps are normally followed:

- 1. Collection of requirements
- 2. Analysis

- 3. Design
- 4. Development
- 5. Testing
- 6. Release

#### Rationale: Why We Need an Automated Testing Application

The main reason why an automated testing application is requested by a customer/user, lies in the need to test an application repeatedly. This is especially useful when an application is upgraded to its new release. In fact, it is normally recommended to execute quality testing for each new release to verify the correct execution of the various functions of the application. This testing includes functions that should not be affected by the changes applied by the evolutionary, perfective, corrective or adaptive maintenance.

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#### **User Point of View**

In general, a user has no perception of the software components being tested. Instead, the user is interested in the elementary processes identified by the transactional functions of the application, such as External Input (EI), External Output (EO) and External Inquiry (EQ). Therefore, from the user's point of view, the part of the software that must be the object of the test coincides with a transactional function that belongs to the functional size of the application being tested.

Therefore, each automated testing must comply with the following general user requirements:

- It must be repeatable over time; that is, the test does not modify the data of the application databases since it would affect the repeatability of the test.
- It has an expected output, which does not vary over time.
- The outcome of the test is made available via the user interface (e.g. on the video screen).

Furthermore, from the user's point of view, the part of the software program that must be the object of the test coincides with a transactional function. Thus, it is easy to understand that the boundary of the automated testing application cannot be different from that of the application being tested for the following reasons:

- Each test is dependent on the transactional function being tested. Therefore, any modification to that function (e.g. cancelation or modification due to the addition or removal of a Data Element Type (DET) or by modification of the logical treatment) would entail a corresponding modification of the related transactional function of the automated testing application,
- 2. An automated testing application enriches the application being tested with transactional functionalities, which must be maintained over time. Therefore, for each transactional function of the automated testing application requested by the user, the overall functional size of the application increases.

#### Assumption

For all these considerations, it is assumed that:

- 1. The automated testing application can also be evaluated using the International Function Points Users Group (IFPUG) Function Point Analysis.
- 2. Each transactional function of the automated testing application may be evaluated if it is a function requested by the user and its aim is to verify an elementary process recognizable by the user.

An automated testing function that does not have these requirements is necessary for non-functional reasons. Examples include security aspects, infrastructure aspects, or technical implementation choices. These cannot be evaluated with the IFPUG Function Point Analysis.

#### **Functional Analysis**

From a functional point of view, the implementation of automated testing is the implementation of a batch procedure. This procedure verifies a transactional function (the one being tested) by calling it with one or more sets of predefined input values. This automated testing function will generate an expected output of the test for each dataset used. The outcome of the test will be declared successful upon verification of this output.

It is normally recommended to execute quality testing for each new release to verify the correct execution of the various functions of the application.

The data set used as input of the transactional function object of the automated testing must be considered as fixed data. Therefore, according to the IFPUG Function Point Analysis, they will not be counted. However, there may be an explicit request to create an application for inserting/modifying the data set to be used as input/output. In this case, according to the IFPUG Function Point Analysis, they will be counted as data functions.

The Files Type Referenced (FTRs) used by the automated testing transactional function will generally be the same FTRs of the transactional function being tested. The FTRs must be accessed in order to verify the functioning of the transactional function. However, these FTRs cannot be maintained by the automated testing transaction function, even if the transaction function being tested maintains them. This is because by definition, the automated testing cannot modify the data to ensure the repeatability of the test.

Regarding the DETs of an automated testing transactional function, generally the input DET is the action that triggers the execution of the test. The output DETs are all those necessary to identify what has actually been tested plus the test result. Please note, the output data of the transactional function being tested, generally does not cross the system boundary. Rather, it is processed and compared within the test itself in order to identify the outcome of the test.



# FEATURE ARTICLE



#### Conclusions

A transactional function for an automated testing is generally configured as an EQ. When there is a logical treatment such as "mathematical calculations are performed" or "derived data is created" it is configured as an EO.

This transactional function will generally have the same FTRs as the transactional function being tested and many DETs determined as follows:

- an Input DET: action,
- many output DETs: as many DETs as the input DETs of the transactional function being tested (excluding the action), plus an outcome DET and a message DET (usually describing an error obtained).

#### **ABOUT THE AUTHOR**



**Maurizio Polidori** holds a master's degree in Engineering with specialization in Computer Science, achieved in 2006 at University of Rome "Tor Vergata." Maurizio has about 20 years of experience in software engineering. He achieved the Certified Function Point Specialist (CFPS) in 2018. He currently works as a Manager in the IT Architecture & Solutions Business Unit of Intellera Consulting S.p.A., an organizational, management and technological consulting company serving the public and private sector. Maurizio acts as a consultant for the Italian Public Administration and in that capacity is responsible for several projects, including the related software function points validation.

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### **CERTIFICATION COMMITTEE**

#### By Daniel B. French, Chair

The Certification Committee works daily to:

- support IFPUG members to take the CFPS / CFPP (IFPUG FP) and CSP/CSS (IFPUG SNAP) exams;
- assist IFPUG members in applying the CFPS CEP (Certification Extension Program) to maintain certifications without retaking the certification exam and evaluating their submissions for extension approval.

The committee has been extremely busy the past few months including working on the following projects:

Jim McCauley has been processing high numbers of Certification Extensions with our support team at CMA, MacAdie and Taylor thanks for the great work.

The Certification Committee continues working with the Non-Functional Software Standards Committee (NFSSC) on developing the training materials for the CSP/CSS certifications.

A dedicated Certification Extension Program will be applicable to this certification. The CSS CEP will also allow the certification to be renewed beyond its three-year validity, as is already possible at present with the CFPS certification.

Translation of the APM into Italian is complete and the CSS/ CSP exam is offered in Italian as well. The Japanese version computerized CPFS exam is also available to take anytime at any Pearson Vue center.

Work continues on creating the certification for Simple Function Point (SFP) measurement. New team members are being assigned to assist with this project and the development of training materials. When completed, notifications will be sent out and information posted on the IFPUG website.

On a final note, as the committee chair, I would like to congratulate the Certification Committee on being named the IFPUG Committee of the Year for 2023. I'm proud to be involved with such an amazing and dedicated team.

A big thank you to all the members of the committee for their dedication, competence, professionalism and great contributions you all make to IFPUG!

The committee is looking for volunteers to assist in these important and exciting projects. If you would like to volunteer and make a valuable contribution to supporting IFPUG while also earning CEP credits, please complete the IFPUG volunteer form on the website at https://ifpug.org/about-us/committees/ volunteer.

# COMMUNICATIONS AND MARKETING COMMITTEE

#### By Carolina Laruccia, Chair

When I assumed the Chair position of the Communications and Marketing Committee (CMC) back in December 2023, I had a clear vision and mission in mind: strengthen the IFPUG brand by communicating through all of our channels its standardized methodologies (FPA, SNAP, SFP) and to expand our network worldwide in such way that would enable IFPUG to become the best-in-class member-governed nonprofit organization when it comes to software development measurement processes.

Such an endeavor is no easy task. And it's thanks to the volunteers that ideas are brainstormed, discussed, worked, edited and executed. Just to name a few of our values, we thrive on accuracy, commitment, honesty, responsibility, and trustworthiness.

As a team, we gather once a month virtually and exchange lots of emails daily to get things done in a timely manner, so that from a communications and marketing perspective we can move along with our yearly planification. Some of our Q1 activities involved a marketing plan and website updates for SFP, thanks to Carla Cioffi and Roberto Meli. Updating SNAP's information and certification, so that more interested people can sit for the exam. We have also been updating and sharing news in relation to new committees and their volunteers. And hopefully we're planning to launch a campaign so that you can tag yourself on social media with your certification badge. If you haven't already done so, please feel free to tag yourself in our official LinkedIn page with your certification diploma and, of course, follow us to stay tuned.

As a closure to this message, we would like to communicate a huge milestone for IFPUG thanks to the PEC: our hybrid (yes, finally, in-person and online) annual event, the ISMA22 Conference in beautiful Madrid. Don't miss out! It will be a great opportunity to get together, see each other again and learn the latest software measurement news with industry experts.

Thanks for reading and see you at ISMA22 or online or in our next edition of *MetricViews!* 

# **COMMITTEE REPORTS**

### **EVENTS COMMITTEE**

#### By Kiran Yeole, Chair

The Events Committee continues its tradition of bringing together leading minds, practitioners, and researchers to delve into the evolving landscape of software metrics and analysis by arranging the events. We arranged a couple of events in the last six months.

#### ISMA (International Software Metrics & Analysis) Conferences:

The Events Committee, along with the Non-functional Sizing Standards Committee (NFSSC), successfully organized the virtual conference ISMA21 on Dec. 1, 2023. The theme of ISMA21 was Non-functional Sizing. We received an overwhelming response from the measurement community for ISMA21. Keynote speakers from the industry delivered thought-provoking talks on non-functional sizing, best practices, and challenges. We covered topics like an overview of the Non-functional Assessment Process (SNAP), sizing zero Function Point projects as well as practical implementations of SNAP and Technical Debt.

We are now gearing up for the **upcoming hybrid conference**, **ISMA22**, scheduled for **Oct. 4**, **2024**, **in Madrid, Spain**. The theme of ISMA22 will be **"IT Value to the Business" with a focus on the C-level**.

#### IFUG Knowledge Café Series:

**IFPUG Knowledge Café series** is an exclusive platform to share your ideas, innovations, and experience in the field of measurement with other IFPUG members and the measurement community. This platform also provides an opportunity to learn from each other's experiences and networking.

Recently we arranged Knowledge Café webinars, and we will continue to plan more to provide learning opportunities for our measurement community.

For more information on these webinars and recordings, you can visit the IFPUG website.

1. Christine Green (Senior Consultant & Advisor) and Alejandro Hernández (Partner and member of LedaMC's Management Committee) presented the topic "Benefits of the IFPUG AD/M Benchmarking Certification." These speakers delved into the success story of LedaMC, the Spanish Benchmark Company that has achieved the esteemed IFPUG Benchmark certification and became the first company to achieve this. Alejandro also explained the motivation behind obtaining this certification and the significant impact it has had on their ability to market benchmark services.

- Diego Rocha (Project Manager at Minsait Brasil and a member of IFPUG's FSSC committee) and Esteban Sanchez (Estimation and Cost Analysis expert and chair of IFPUG's FSSC committee) presented the topic "Elementary Processes and User Stories." In this webinar, the speakers illustrated the application of the elementary processes rules for identifying EPs for epics, features and user stories.
- 3. Steven Woodward (President of Cloud Perspectives and former IFPUG Director) presented the topic "Applying Function Points to Cloud Computing." This webinar helped the audience to gain knowledge on cloud computing eco-system perspectives, applying/interpreting function points for cloud computing environments and additional measurement findings.

We regularly offer platforms for interesting topics to be discussed at our Coffee Talks and ISMA conferences. Please write to pec@ifpug.org with your suggestions for topics and speakers. If you are interested in working with the PEC, please complete and send a volunteer form to pec@ifpug. org or submit the form using https://ifpug.org/about-us/ committees/volunteer.

### FORECASTING AND SOFTWARE ESTIMATION COMMITTEE

#### By Christine Green, Chair

IFPUG has initiated a new committee, the Forecast and Software Estimation Committee, marking a pivotal moment in enhancing software project forecasting and estimation knowledge for the benefit of our members. Launched with an initial kick-off meeting, this committee is set to leverage IFPUG 's extensive expertise in functional size measurement, aiming to support the industry standards for accuracy and reliability in software estimation.

The committee has volunteers from all over the world including Asia, North and South America, and Europe bringing a strong perspective of the industry's usage of forecasting and estimation techniques worldwide. The new committee is led by the former President of IFPUG, Christine Green.

Currently drafting its mission and vision, the committee's primary focus is establishing a solid foundation to guide its strategic initiatives. This early phase is crucial for aligning with IFPUG 's broader goals and addressing the software industry's pressing needs, especially regarding the pricing and costing of software projects.

# FUNCTIONAL SIZING STANDARDS COMMITTEE

#### By Esteban Sanchez, Chair

The Functional Sizing Standards Committee (FSSC) has a well-defined north: to support the IFPUG community in the application of the Counting Practices Manuals (CPMs) for both, simple and traditional function points. Our team works with passion and commitment to maintain and augment the guidelines in the manuals, ensuring a consistent application of the standards around the world. While technology continues to constantly evolve, we follow closely by publishing new guidelines and examples to keep the function points methodology at a state of the art.

Our most recent publication, "Elementary Processes and User Stories" is a masterpiece in the realm of Agile methodologies; the paper provides examples of common scenarios for counting function points in Agile Software Development (ASD) and their analysis according to the rules of the CPM. The paper was presented recently at an IFPUG webinar and will also be presented in the upcoming GUFPI-ISMA conference in May.

The FSSC recently put the magnifying glass on the topic of system clock and other platform data (information provided by the operating system to the applications). The result of this analysis will be a comprehensive paper with guidelines on how to count system clock and other platform data. The paper will include examples and recommendations on what things can continue to be treated as functional and hence covered under the umbrella of the CPM/SPM, and what aspects should be considered non-functional and therefore approached thru the Software Non-Functional Assessment Process (SNAP). This paper is under review and the plan is to release it in May. The paper will also be presented as a CEP workshop at the next ISMA conference in Madrid later this year!

On the back burner is a case study on the topic of mobile applications. This will be a comprehensive work that illustrates the application of function points to a full mobile application with cloud backend.

We are also pleased to announce that significant progress has been made on the topic of artificial intelligence (AI) and software bots. We have a whitepaper cooking in the oven for you. This paper will illustrate the application of the function points methodology to business process modelling notation (BPMN) as applied to software bots. Stay tuned for this release, which is planned for later in Q2.

If you want to be part of the team that is making all these great things possible, just get in touch with us. Please complete the IFPUG Volunteer Form on the IFPUG website: https://ifpug.org/about-us/committees/volunteer. Our mission is to serve IFPUG and its members and we love to innovate. If you have feedback or suggestions for new projects, we definitely want to talk to you. Please kindly submit your comments to esanchez@galorath.com.

### **INTERNATIONAL MEMBERSHIP COMMITTEE**

#### By Paola Billia, Chair

In April, I took on the role of chair of the International Membership Committee (IMC). I am enthusiastic and I thank Loami (the previous Chair of the IMC) and the entire IFPUG board of directors for this opportunity.

Today, the committee is made up of 10 members, each of whom looks after the IFPUG members of their respective country. At the moment, there are nine countries represented: Brazil, Italy, China, France, Argentina, Colombia, India, South Korea, and Spain but we hope that that number will grow. We are working to create a support network for each country that can bring members even closer to the IFPUG Headquarters. Furthermore, in the next month we will work to support the voluntary translation process of the Manuals (CPM/APM/SPM) and the International Policies & Procedures Manual.

Finally, I would like to thank the entire IMC team for the work they will be doing with the members of their countries and for all the ideas they will be sharing and developing.

### INDUSTRY STANDARDS COMMITTEE UPDATE

#### By Carol Dekkers, Chair

CONGRATULATIONS TO ALL IFPUG MEMBERS! SNAP (Software Non-functional Assessment Process) has passed the Draft International Standard (DIS) ballot and has been approved by ISO/IEC/IEEE for publication by the end of 2024 as ISO/IEC/IEEE 32430 Software Non-functional Size Measurement!

This is the first-ever non-functional size measurement standard approved for ISO/IEC/IEEE publication and together with our IFPUG 4.3.1 (ISO/IEC 20926) standard, provides a more thorough assessment of size for the software industry.

Appreciation goes out to both the IEEE and ISO/IEC working groups led by our IEEE and ISO/IEC project editor Talmon Ben Cnaan, co-editor and USNB representative Carol Dekkers, Italian NB head of Delegation Cinzia Ferrero, and our statistician/ researcher Charley Tichenor. Many more industry experts from around the world and IFPUG representatives to IEEE and ISO/IEC also provided valuable input.

## **COMMITTEE REPORTS**

This was an arduous journey starting with the SNAP trial use standard in 2018, progressing through the ISO/IEC and IEEE joint standardization working groups, then transposing the standard into a full use standard. Again, congratulations to our entire team for a job well done!

A second initiative is also underway with Dr. Bradford Clark at the Boehm Center for Software and Systems Engineering (CSSE) at the University of Southern California, where he and his team are developing COCOMO III—an updated and advanced version of the previous COnstructive COst Model (COCOMO II). Dr. Clark has been receptive to including both IFPUG function points and SNAP points in the new model, which is slated for release by the end of 2024.

For anyone who missed the e-blast earlier this year, it is worth noting that the U.S. Government Accountability Office (GAO) published a publicly (free) available Agile Assessment Guide which mentions Simple Function Point usage at the U.S. Department of Homeland Security Cost Analysis Division (DHS CAD) as part of agile cost estimation. (Download the entire 300+ page guide from this webpage https://www.gao.gov/products/ gao-24-105506.)

ISC ongoing work:

- Participation as part of the INCITS (U.S. technical advisory work) to ISO/IEC JTC1 SC7 Systems and Software Engineering Standards) Carol Dekkers, CFPS (Fellow).
- Subcommittee 38 work (by Steve Woodward, CFPS, of Canada, who works with both SC38 and as the liaison to SC7).

So much good news this month! Thank you for your continued interest and support in our industry standards work!

Berlin Meeting Report

May 27 - 31, 2024



The ISO/IEC/IEEE 32430 Software Non-functional Size Measurement standard has been approved for publication by the end of 2024, and the IFPUG Industry Standards Committee (ISC) expresses appreciation to everyone involved in our standardization efforts since 2010 (the year that SNAP was first published) and especially members of the IEEE working group for IEEE 32430:

- Talmon Ben-Cnaan
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- Altaz Valani
- Steven Woodward;
- IEEE staff members: Christy Bahn, Jodi Haasz and Erin Morales;
- and current and former members of ISO/IEC JTC1 SC7 WG6 including the following national body representatives:



- Argentina: Paula ANGELERI;
- Australia: Tafline RAMOS;
- Brazil: Danilo SCALET;
- Canada: Witold SURYN and Steve WOODWARD;
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- UK: Andrew BANKS;
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- IEEE: Talmon BEN-CNAAN;
- and the current and former IFPUG board members over the years. THANK YOU ALL!!!

It takes an entire community and a multi-year journey to take an existing in-use standard to ISO/IEC/IEEE standard level.

KUDOS AND CONGRATULATIONS to everyone involved!

Carol Dekkers, ISC chairperson



191 Clarksville Road Princeton Junction, NJ 08550 USA

Contact IFPUG Headquarters at +1-609-799-4900 or ifpug@ifpug.org.