2 - 4 DE SEPTIEMBRE DE 2015

1ER CONGRESO NACIONAL DE MEDICIÓN Y ESTIMACIÓN DE SOFTWARE

UNIVERSIDAD IBEROAMERICANA
CIUDAD DE MÉXICO ®

Workshop: Aproximación de Tamaño Funcional con EPCU

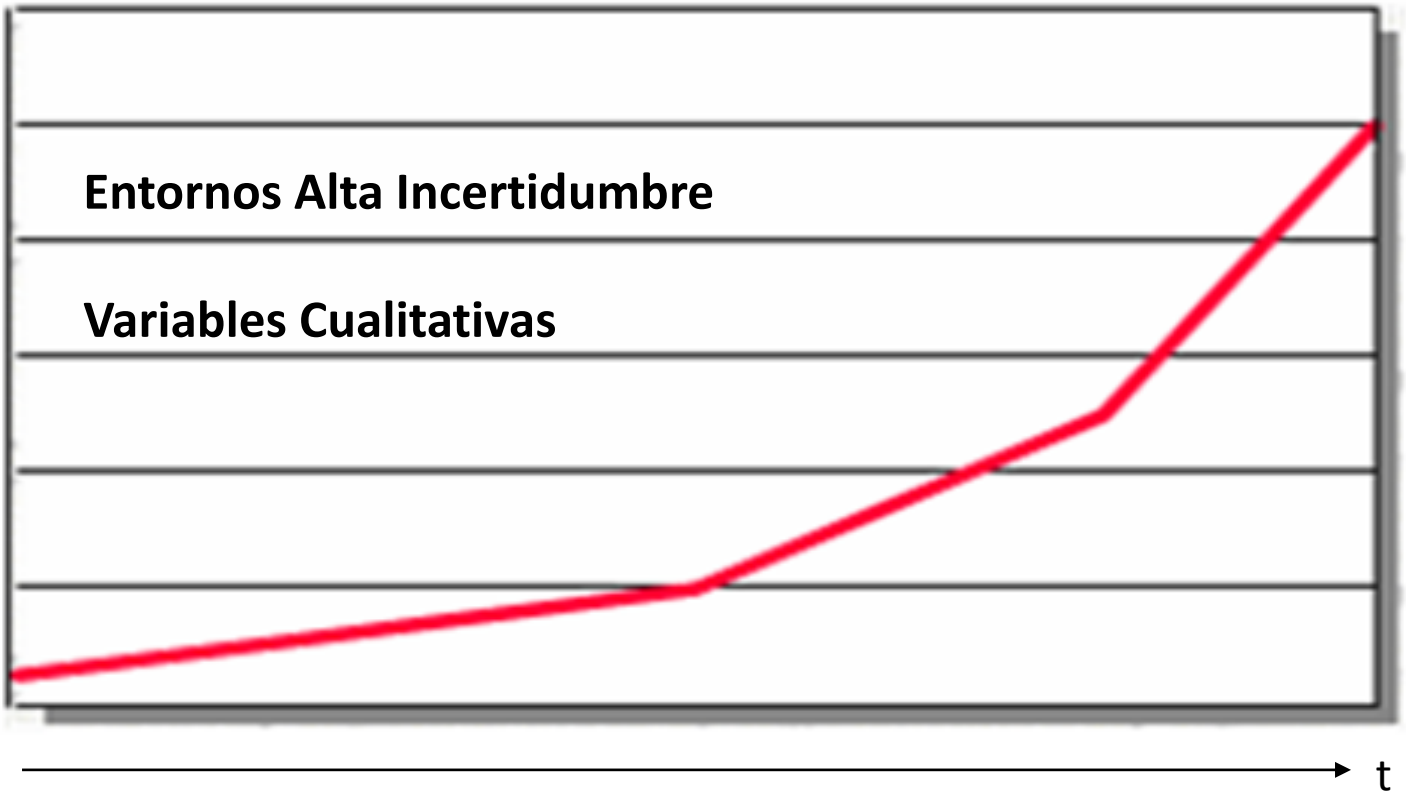
spingere

Dimensionamiento y Estimación Profesional de Software!

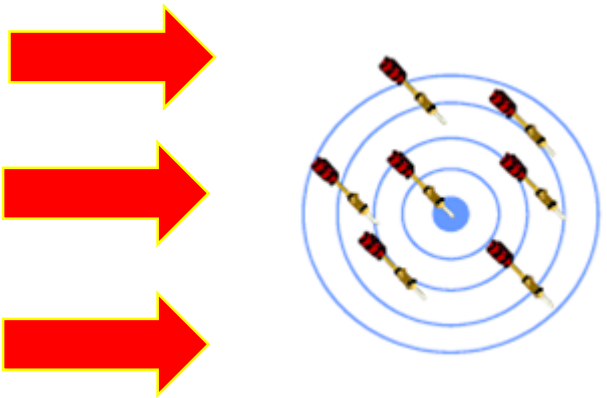
AMMS

COSMIC

Adquisición de Información proyectos de Software



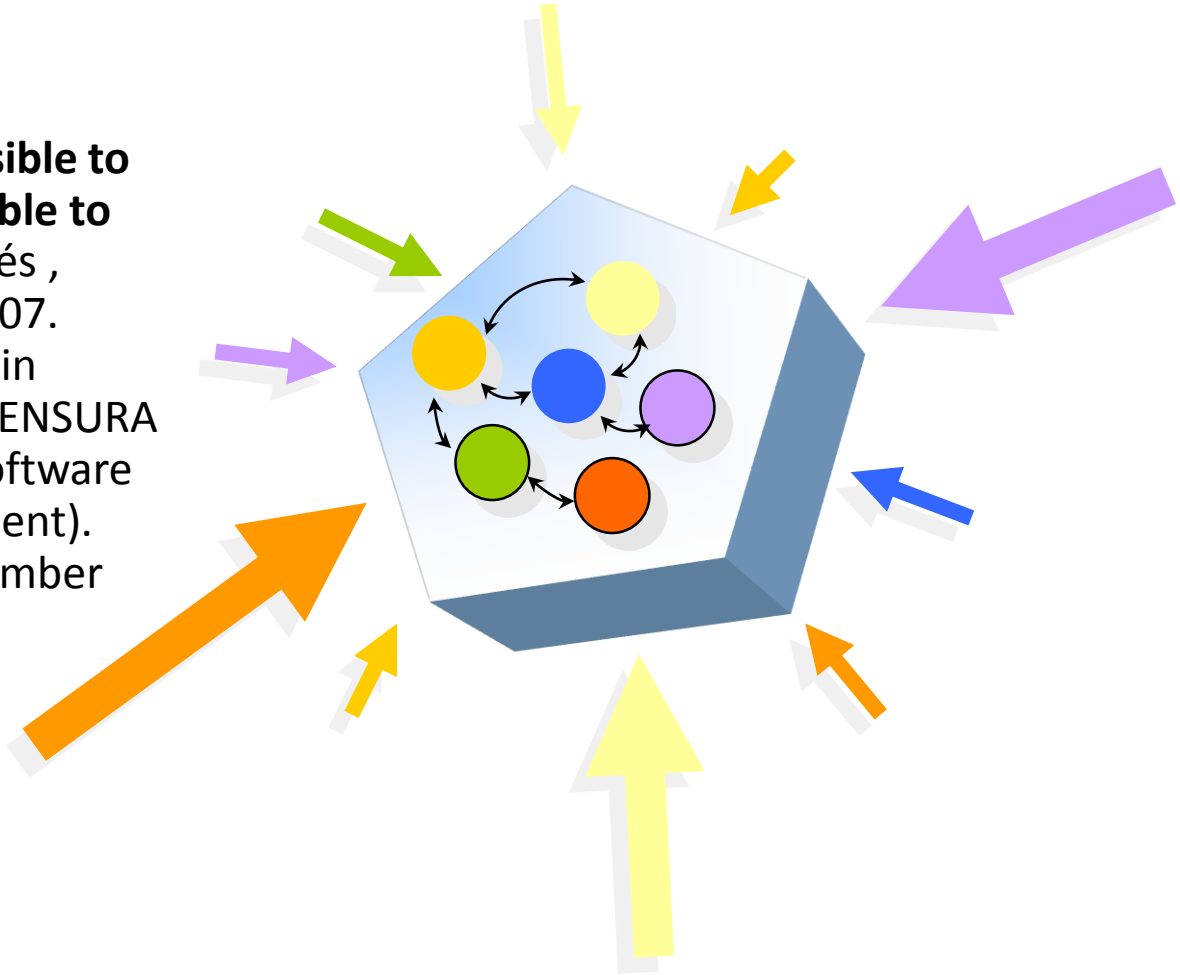
Enfoque más utilizado para estimar: Juicio de Experto (Discrecionalidad)



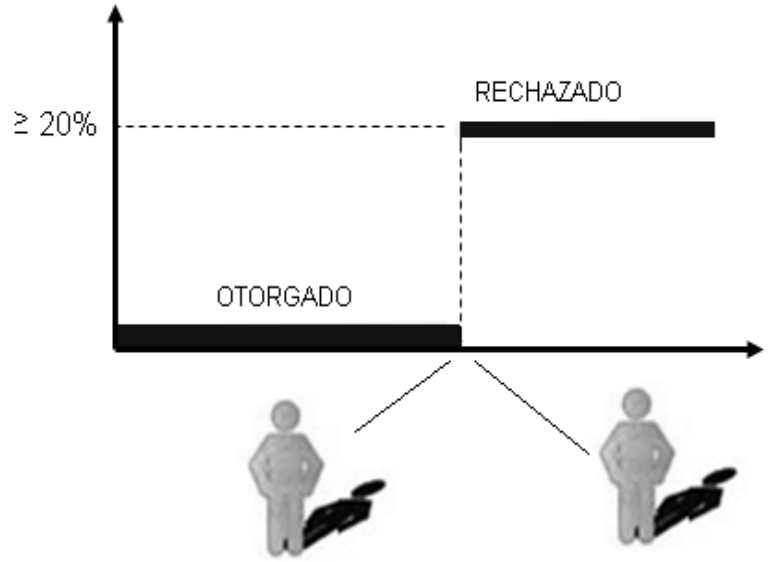
Generador de Estimados

Estimation of Projects in Contexts of Uncertainty (EPCU)

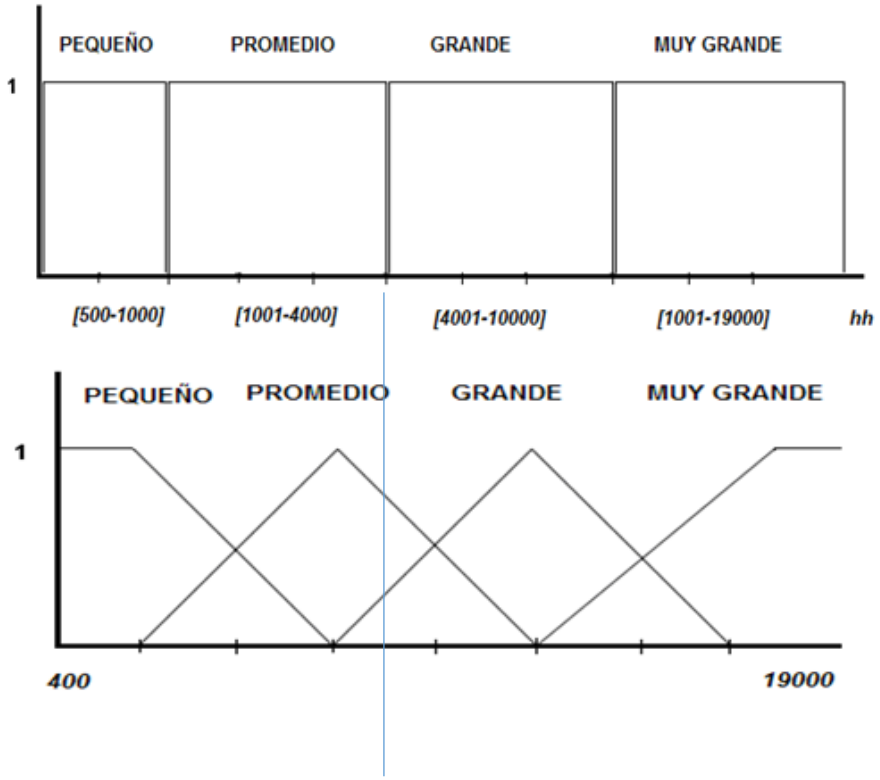
- "**The Uncertainty: it is not possible to measure it , however it is possible to contextualize it**" Francisco Valdés , Alain Abran, IWSM-Mensura 2007. IWSM (International Workshop in Software Measurement) and MENSURA (International Conference on Software Process and Product Measurement). Palma de Mallorca, Spain, November 2007



Concepto Modelo EPCU

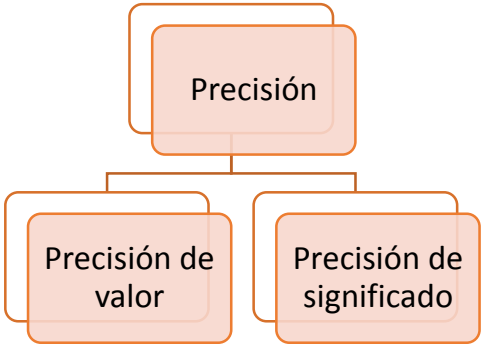


SUELDO:	$100,000.00	$99,990.00
MENSUALIDAD:	$19,999.00	$19,999.00
CAPACIDAD PAGO:	19.999%	20.001%
STATUS CRÉDITO:	OTORGADO	RECHAZADO

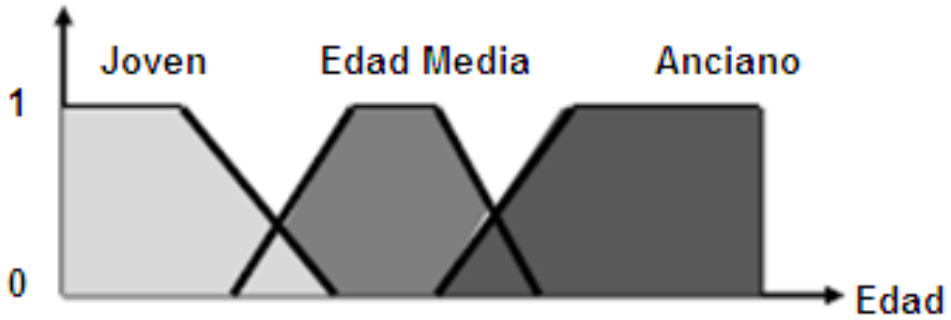


Precisión de la Información

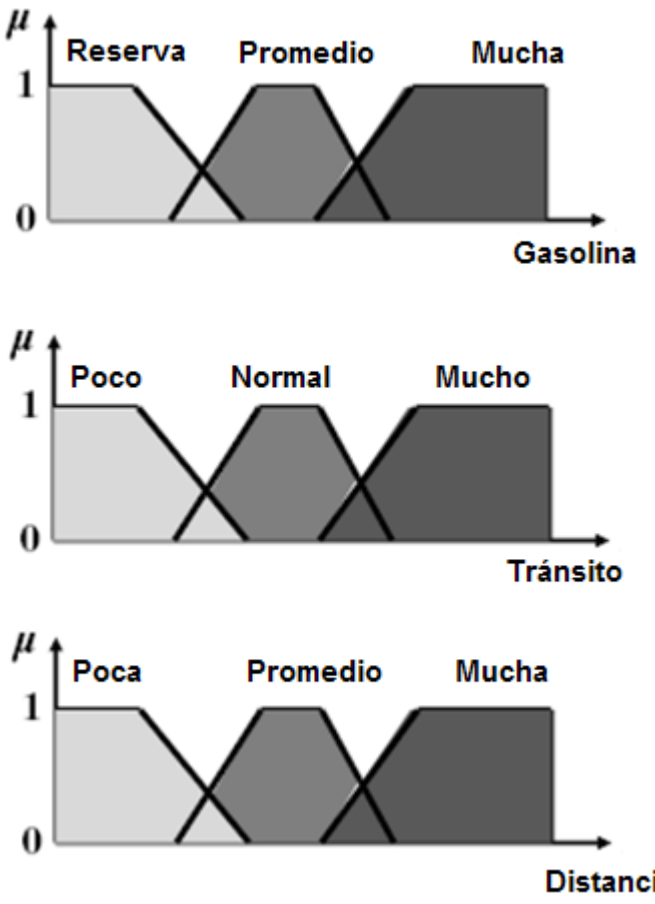
- Necesidad de diferenciar entre dos formas de precisión.



- *X = 5 -> precisión de valor*
- *a <= X <= b* precisión de significado si se conoce *a* y *b*
- *X -----> X es joven> imprecisión significado y de valor*
- *X es joven (definida por una función) -> imprecisión valor ;* ***precisión de significado.***

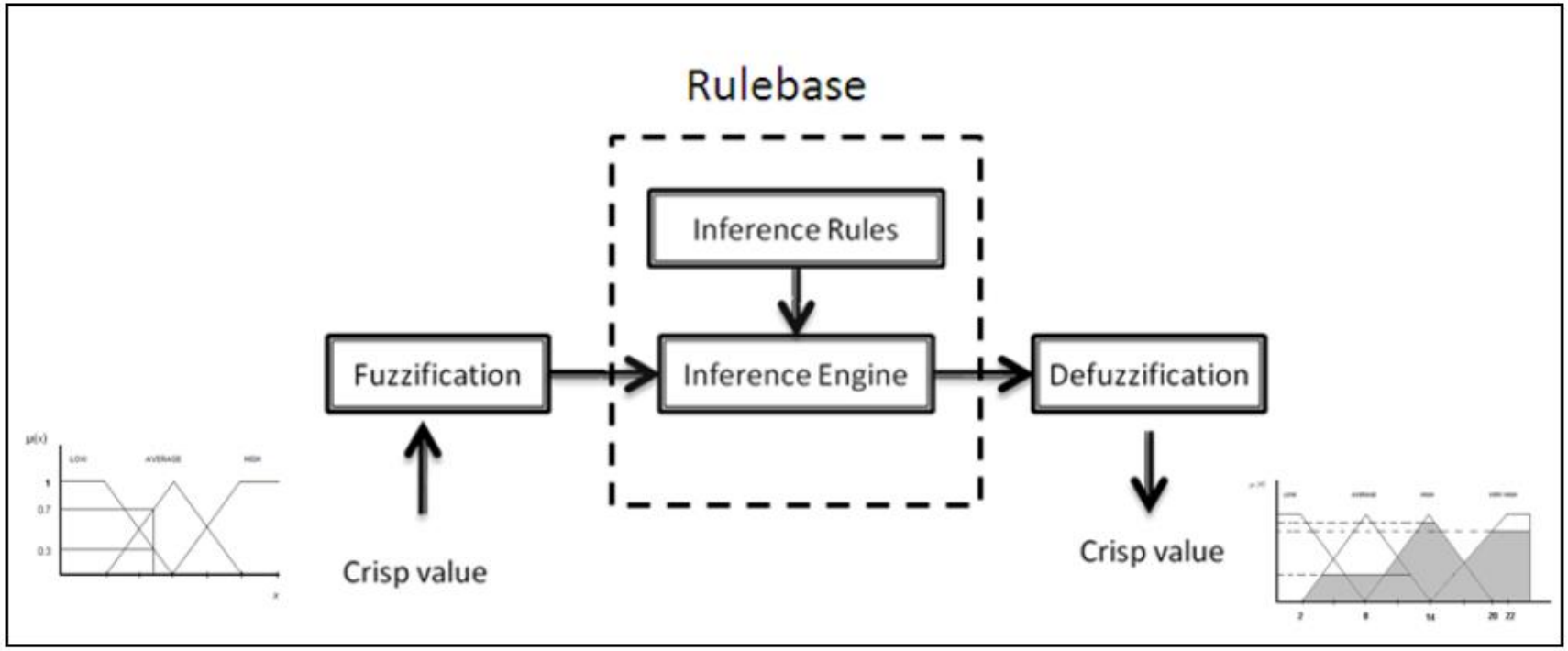


Concepto Modelo EPCU

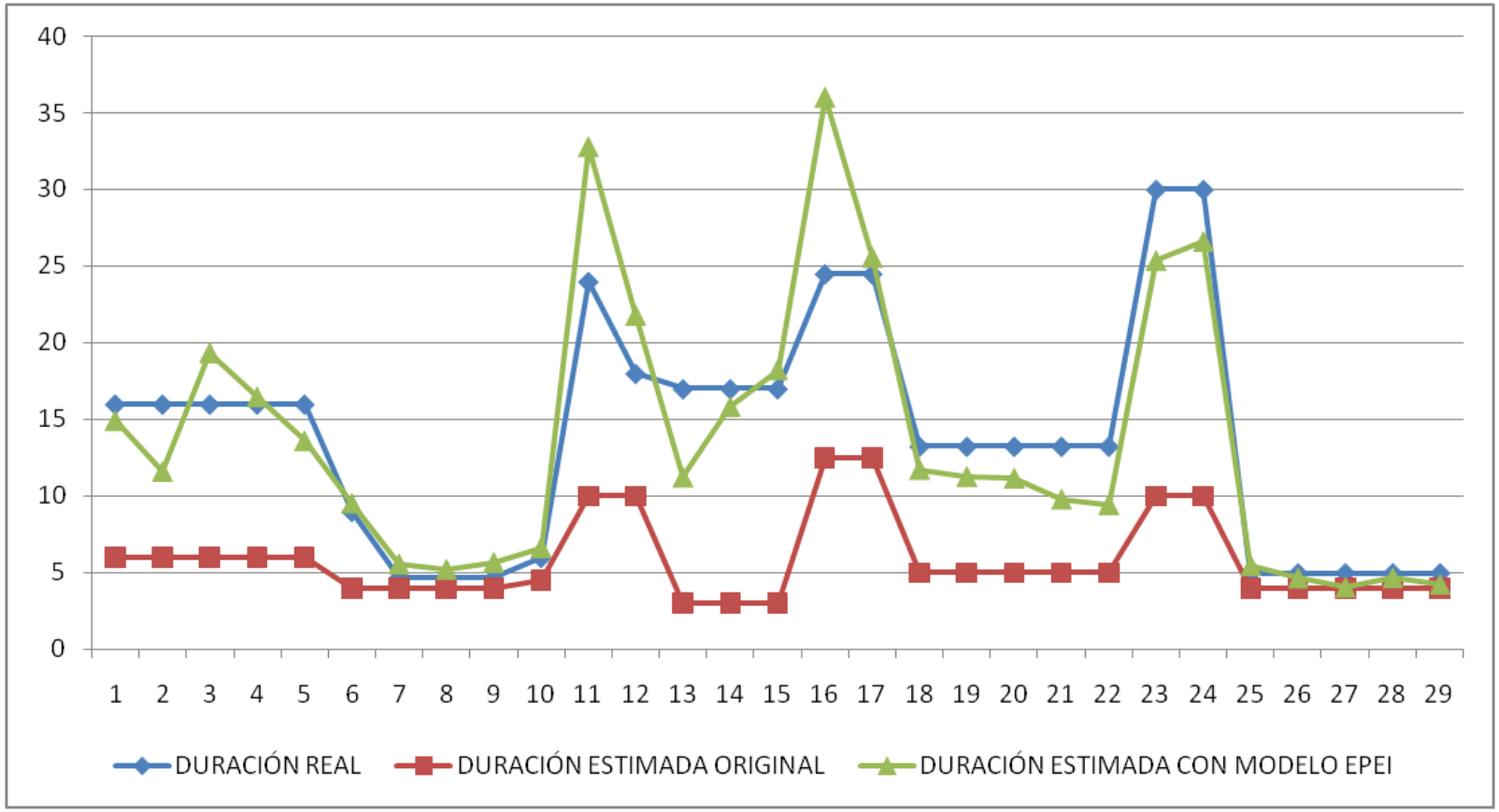


- Si **Gasolina** está en **Reserva** y hay **Mucho Tránsito** y la **Distancia** es **Mucha** paso a cargar gasolina.
- Si la **Gasolina** está en **Reserva** y el **Tránsito** es **Poco** y la **Distancia** es **Poca** no necesito pasar a cargar

Modelo EPCU



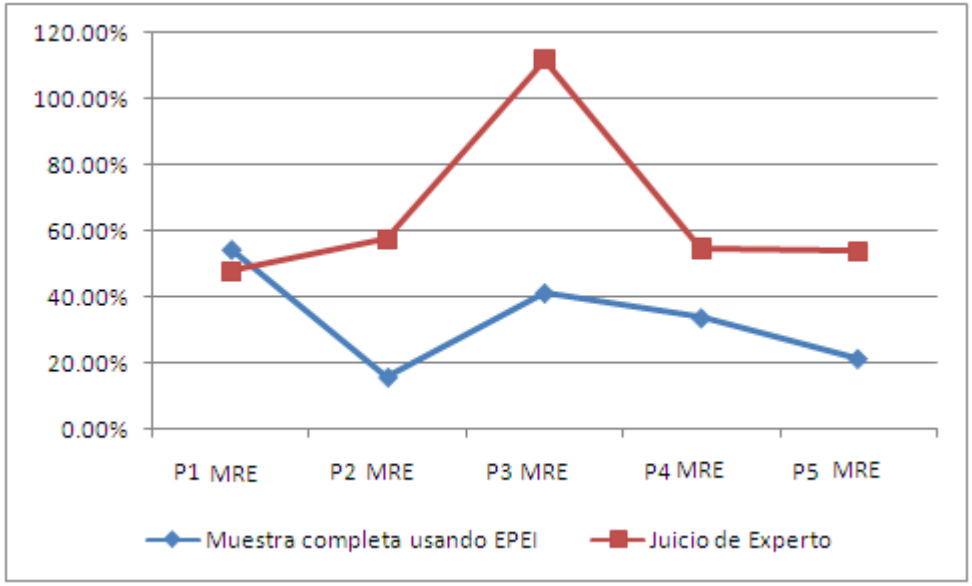
Resultados

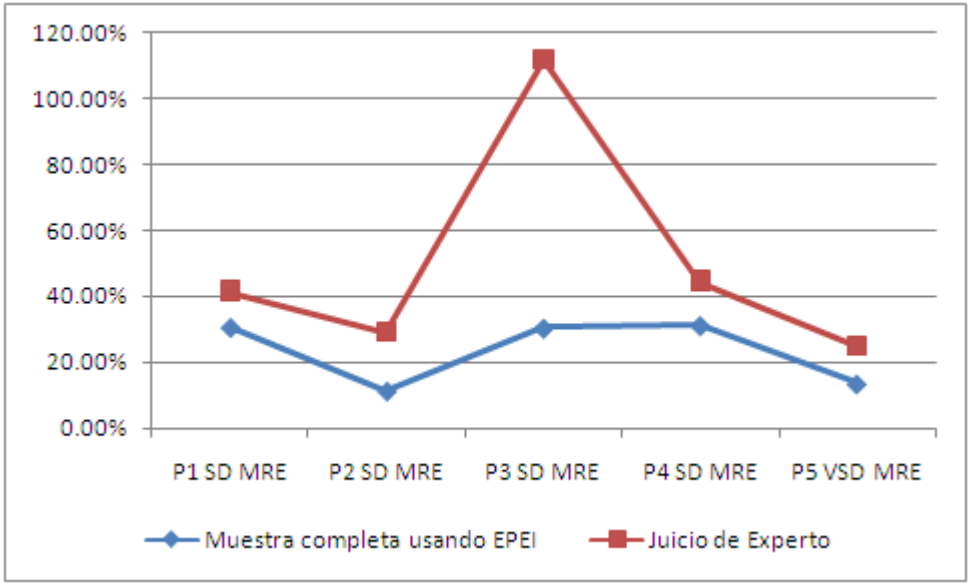


		FULL SAMPLE	MORE THAN 5 YEARS EXPERIENCE IN SOFTWARE DEVELOPMENT	LESS OR EQUAL THAN 5 YEARS EXPERIENCE IN SOFTWARE DEVELOPMENT	MORE OR EQUAL THAN 10 YEARS PROFESSIONAL EXPERIENCE	LESS THAN 10 YEARS PROFESSIONAL EXPERIENCE	NON IT PROFESSIONALS	IT PROFESSIONALS
People Amout		84	31	44	45	39	25	59
P1	MMRE	55%	54%	55%	59%	55%	52%	56%
	SD MRE	31%	30%	33%	30%	31%	31%	30%
	Pred(25%)	21%	23%	23%	16%	46%	20%	22%
People Amout		84	31	44	45	39	25	59
P2	MMRE	16%	17%	14%	16%	16%	18%	15%
	SD MRE	11%	11%	11%	12%	10%	11%	11%
	Pred(25%)	85%	84%	89%	82%	87%	84%	85%
People Amout		84	31	44	45	39	25	59
P3	MMRE	41%	44%	40%	40%	43%	46%	39%
	SD MRE	30%	31%	31%	29%	32%	28%	31%
	Pred(25%)	42%	39%	45%	42%	41%	32%	46%
People Amout		83	31	43	45	38	25	58
P4	MMRE	34%	31%	37%	32%	36%	27%	37%
	SD MRE	31%	30%	32%	31%	31%	27%	32%
	Pred(25%)	58%	61%	56%	60%	55%	64%	57%
People Amout		83	31	43	45	38	25	58
P5	MMRE	21%	24%	19%	23%	19%	22%	21%
	SD MRE	13%	16%	11%	15%	11%	12%	14%
	Pred(25%)	80%	71%	91%	76%	87%	76%	81%

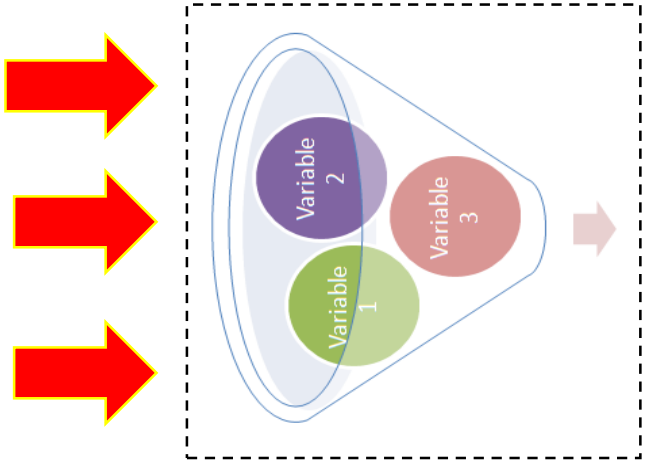
Comparando MMRE y SD MRE

		Muestra completa usando EPEI	Juicio de Experto
P1	MMRE	54.51%	47.79%
	SD MRE	30.60%	41.53%
P2	MMRE	15.90%	57.34%
	SD MRE	11.27%	28.97%
P3	MMRE	41.35%	111.86%
	SD MRE	30.37%	111.62%
P4	MMRE	33.82%	54.72%
	SD MRE	31.17%	44.52%
P5	MMRE	21.50%	53.62%
	SD MRE	13.43%	24.90%

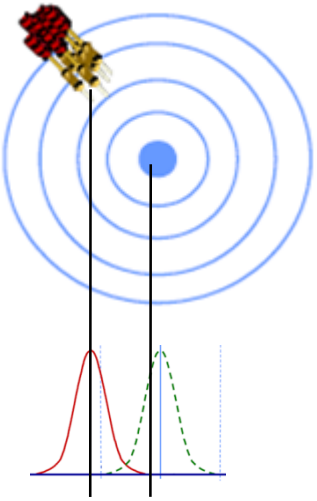




Resultados: Enfoque EPCU (Evita Discrecionalidad)



Generador de Estimados



Approximate Sizing Approaches **Examples** in the COSMIC Advanced and Related Topics

I. Example 1: the Average Functional Process approach.

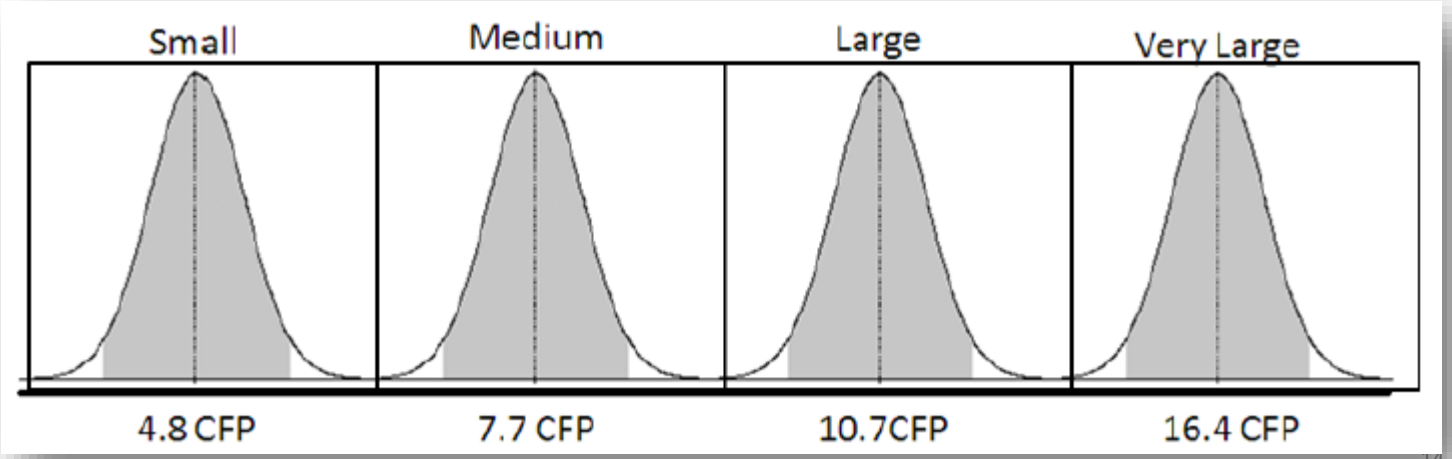
II. Example 2: the Fixed Size Classification approach.

III. Example 3: the Equal Size Bands approach. (Vogelezang named as: Refined Approximate or Quartile approach)

IV. Example 4: the Average Use Case approach.

Example 3: the Equal Size Bands approach. (Refined Approximate or Quartile approach)

- (Vogelezang , 2007)used measurements on 37 business application development projects, each having a total size greater than 100 CFP. **The quartile** values from this dataset are as follows: **Small** = 4.8 CFP, **Medium** =7.7 CFP, **Large** = 10.7, and **Very Large** = 16.4 CFP [14]



Each example about the Approximate Sizing Approaches is based on two main assumptions:

1. Historical data exist for calculating the scaling factor (average, or size bands).
2. The whole set of requirements is described, or at least there is a commitment, defined by the requirements, about the scope of the software to be developed .

	Needs local calibration	Requirement granularity level	Consideration
Average Functional Process	X	Functional Process	This approximation is valid as long as there is sufficient reason to assume that the sample on which the size of the average functional process is calculated is representative for the software of which the functional size of which size is approximated. [38]
Fixed Size Classification	X	Functional Process	This approximation is valid as long as there is sufficient reason to assume that the assigned size classification is representative for the software of which the functional size of which size is approximated. [38]
Equal Size Bands approximation	X	Functional Process	This method is recommended for the approximate sizing of software where the distribution of the functional process sizes is skewed. For the business application this method has little added value over the average functional process method (1) or the fixed size classification method (2). [38]
Average Use Case approximation	X	Use Case	This approximation is valid as long as there is sufficient reason to assume that the assigned size classification of an average use case is representative for the software of which the functional size of which size is approximated. [38]
Early & Quick COSMIC approximation	X	Multilevel Approach (*)	The precision of the method is strongly dependent on the training and capability of the practitioners who use it to understand the categories at higher levels of granularity. [38], this approximation approach combines scaling and classification approaches.
Quick/Early		Use Cases	The precision is directly proportional to the level of granularity of the analyzed use cases model.
EPCU approximation approach		Functional Process & Use Cases	Does not require local calibration (less expensive) and is useful when there are no historical data available.

Sizing Approach without using Historical Data in a Reference Project

Case Study: COSMIC Approximate Sizing Approach Without Using Historical Data

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Abstract—In mature engineering disciplines, international **consensus can be reached on measurement, as evidenced through established measurement standards. In software engineering, there are 5 functional size measurement standards. These standards work best when the functionality to be measured is fully known, although this usually doesn't happen in the early phases of software development.**

The techniques most often used to approximate the sizing of the software to be developed in the early phases involve historical data. However, gathering historical data is a challenge in itself. This paper proposes the use of a fuzzy logic model to approximate the functional size of a piece of software.

Information Analysis

Practitioners	Real Value	Estimated Functional Size using 'Equal Size Bands' approach	MRE	Context B Estimated Functional Size using EPCU (TO 16.4)	MRE	Difference
1	107	108.1	1%	167.1	56%	55%
2	107	111.2	4%	168.4	57%	53%
3	107	107.9	1%	176.9	65%	64%
4	107	84.6	21%	155.1	45%	24%
5	107	81.7	24%	108.1	1%	23%
6	107	131.9	23%	140.1	31%	8%
7	107	111	4%	171.3	60%	56%
8	107	119.9	12%	189.6	77%	65%
9	107	93.5	13%	78.3	27%	14%
MRE AVERAGE			**11%**		**47%**	

Table 3. Experiment Results

Information Analysis

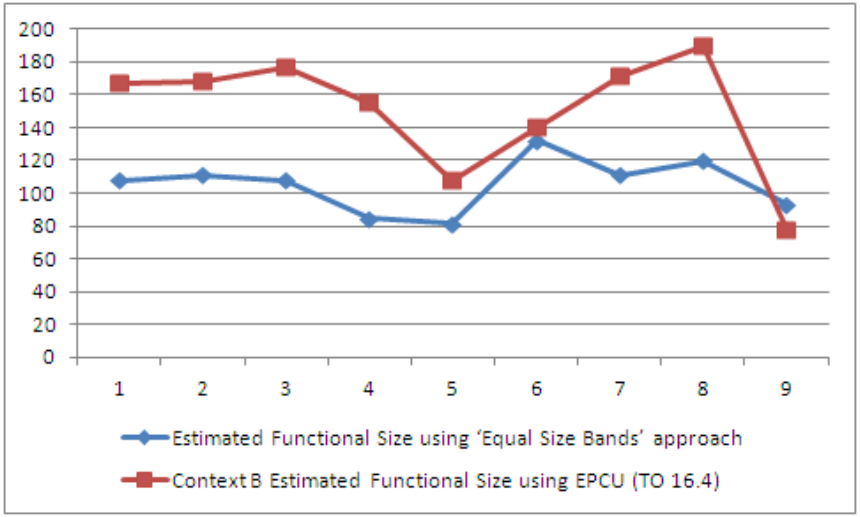

Figure 9. Equal Size Bands approach versus the EPCU model approach

- The form of the curves shows a similar behavior.
- SDMRE with the EPCU model of 23% and an MMRE of 47%. This MMRE is higher than that of the Equal Size Bands approach value of 36%, and the SDMRE value is also higher, at 14% .
- The maximum MMRE difference is 65%, and the minimum difference is 8%.
- The EPCU context does not have to be calibrated: it does not use bands, but rather a continuous range in ε **R.**

2014

COSMIC Approximate Sizing Using a Fuzzy Logic Approach: An Experiment with Industry Data

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Sizing Approach without using Historical Data in a Real Project

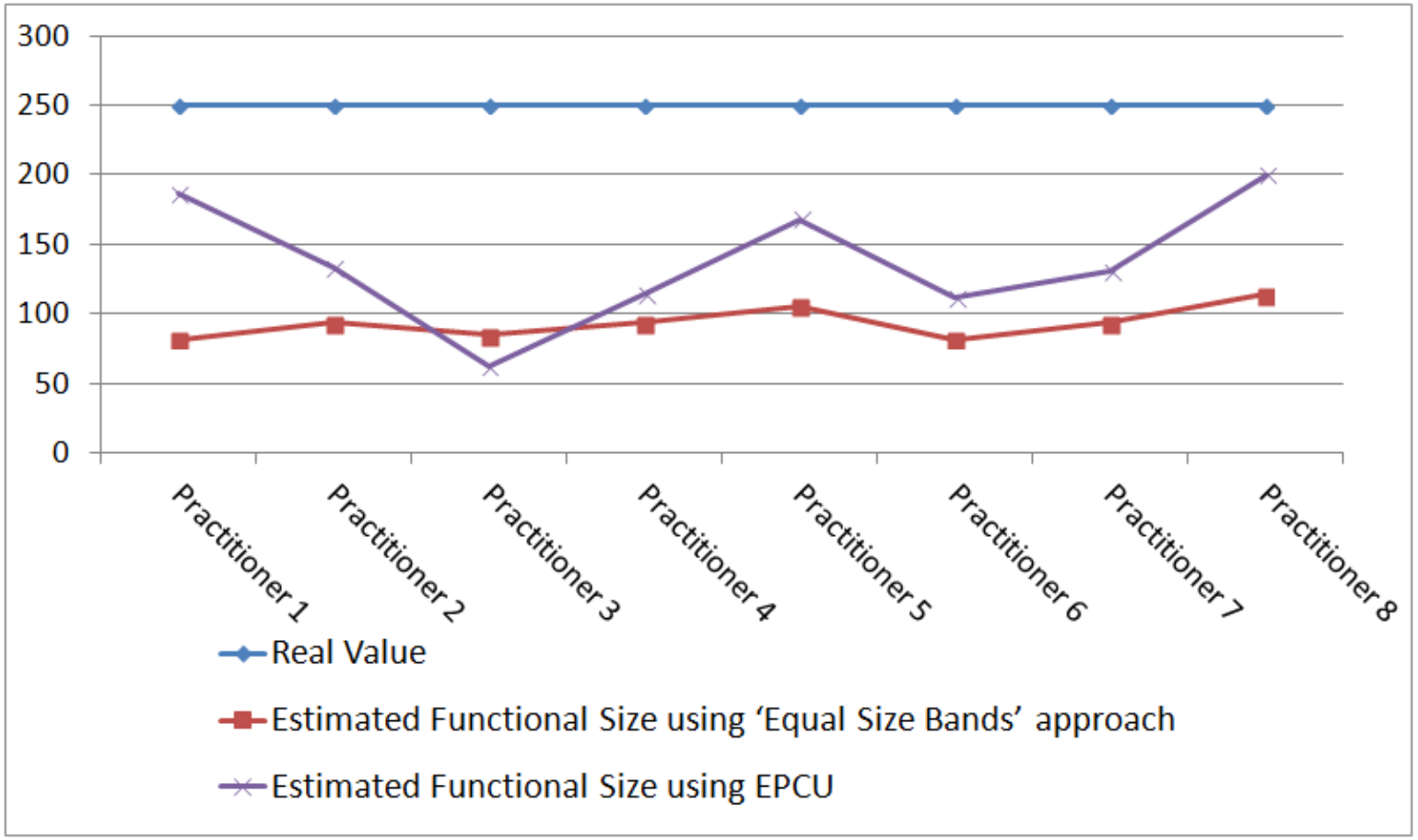
Use case Id	Entry in CFP	Exit in CFP	Read in CFP	Write in CFP	Size in CFP
Use case 1	1	7	6	2	16
Use case 2	5	18	23	9	55
Use case 3	1	12	12	2	27
Use case 4	1	4	2	1	8
Use case 5	1	1	7	0	9
Use case 6	1	2	3	0	6
Use case 7	1	11	11	3	26
Use case 8	1	4	3	0	8
Use case 9	4	3	6	3	16
Use case 10	1	1	1	1	4
Use case 11	5	4	9	5	23
Use case 12	3	3	7	3	16
Use case 13	3	2	5	4	14
Use case 14	1	7	14	0	22
Total size					**250**

Sizing Approach without using Historical Data in a Real Project

Practitioners	Reference Functional Size in CFP	Estimated Functional Size using EPCU Approximation approach (TO 16.4)	MRE
Practitioner 1	250	186.32	25%
Practitioner 2	250	132.76	47%
Practitioner 3	250	62.19	75%
Practitioner 4	250	114.34	54%
Practitioner 5	250	168.13	33%
Practitioner 6	250	111.26	55%
Practitioner 7	250	130.43	48%
Practitioner 8	250	199.82	20%
MMRE			**45%**
SDMRE			**18%**

Practitioners	Reference Functional Size in CFP	Estimated Functional Size using 'Equal Size Bands' approach	MRE
Practitioner 1	250	81.7	67%
Practitioner 2	250	93.3	63%
Practitioner 3	250	84.6	66%
Practitioner 4	250	93.3	63%
Practitioner 5	250	105.2	58%
Practitioner 6	250	81.7	67%
Practitioner 7	250	93.5	63%
Practitioner 8	250	114	54%
MMRE			**63%**
SDMRE			**5%**

Sizing Approach without using Historical Data in a Real Project



2015

Improving the COSMIC Approximate Sizing Using the Fuzzy Logic EPCU Model

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Abstract. In software engineering, the standards for functional size measurement require, for accurate measurement results, that the functionality to be measured be fully known. Therefore, in the early phases of software development when there is a lack of details, approximate sizing approaches

Improving COSMIC Approximation Sizing

#Projects	Sector	Project Range	Project Average Functional Size	#FP	Size
26	Banking	11-2743	476	1345	12375
8	Government	64-2364	481	838	3845
6	Insurance	84-1311	551	342	3305
7	Logistics	193-1164	538	321	3766

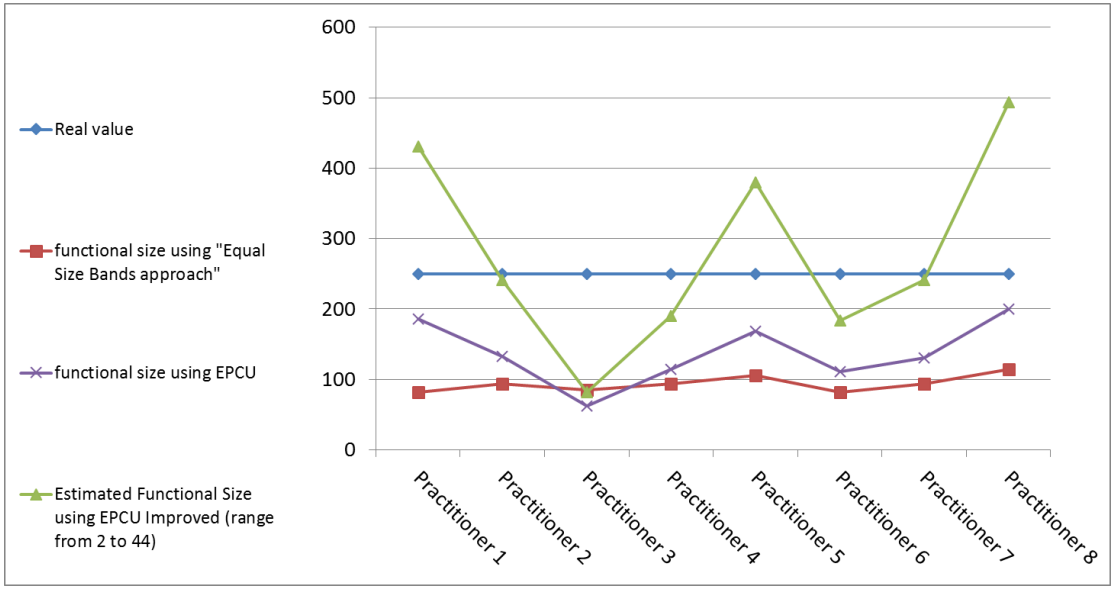
Table 2. Dataset Characterization

Quartile		% FP included	Description	Average Value
Q1	Small FP's	55%	contains FP's in the range up to 6 CFP	3.7
Q2	Medium FP's	26%	contains FP's in the range 6-10 CFP	7.7
Q3	Large FP's	14%	contains FP's in the range 10-25 CFP	14.6
Q4	Very Large FP's	5%	contains FP's of 25 CFP and larger	44.1

Table 3. Q-Size considering four sectors

Improving COSMIC Approximation Sizing

Practitioner	Reference Functional Size in CFP	Estimated Functional Size using the 'Equal Size Bands'	MRE	Estimated Functional Size using EPCU (range from 2 to 16.4)	MRE	Estimated Functional Size using EPCU Improved (range from 2 to 44)	MRE
Practitioner 1	250	81.7	67%	186.32	25%	430.76	72%
Practitioner 2	250	93.3	63%	132.76	47%	240.74	4%
Practitioner 3	250	84.6	66%	62.19	75%	81.65	67%
Practitioner 4	250	93.3	63%	114.34	54%	190.33	24%
Practitioner 5	250	105.2	58%	168.13	33%	379.86	52%
Practitioner 6	250	81.7	67%	111.26	55%	183.14	27%
Practitioner 7	250	93.5	63%	130.43	48%	240.91	4%
Practitioner 8	250	114	54%	199.82	20%	493.47	97%
MMRE			**63%**		**45%**		**43%**
SDMRE			**5%**		**18%**		**34%**



Mecanismos de Estimación de Proyectos y Evaluación (MEPE)

Actualmente la mayoría de la toma de decisiones relativas a la estimación de proyectos de software y a la evaluación de distintos elementos en la gestión de los mismos está basada en mecanismos empíricos, lo que dificulta el tener resultados exitosos en la gestión de proyectos.

MEPE es un micro sitio construido con la finalidad de poner a disposición de desarrolladores, administradores de proyectos, analistas, ejecutivos e investigadores, mecanismos formales que han sido desarrollados para soportar la evaluación, y estimación en distintas etapas del ciclo de vida de los proyectos desde una perspectiva aplicada a la realidad.

Estos mecanismos tienen fundamentos matemáticos sólidos, han sido presentados en distintas conferencias nacionales e internacionales y publicados en distintas revistas o libros, lo más importante pueden ser utilizados inmediatamente!.

"The British Computer Society has reported that 87.3% of 1027 software projects investigated have not been accomplished successfully"

British-Computer-Society. 2000. IT Projects: Sink or Swim. UK: The British Computer Society, Computer Bulletin

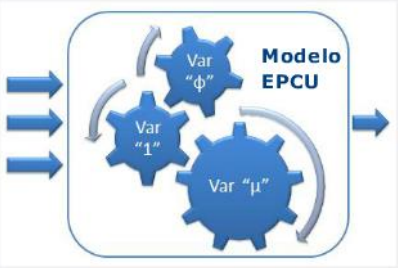
Mecanismos de Estimació | www.mepe.com.mx/paym

www.mepe.com.mx/payment/flash/EST20131211PRXFUC.swf

Aproximación de Tamaño Funcional de Software basado en COSMIC (ISO/IEC 19761) con base a Casos de Uso (EPCU Approximation approach)

USE CASE SIZE 4

LEVEL OF OBJECT OF INTEREST 3.5



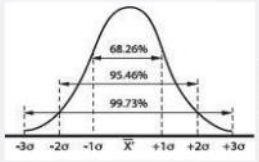
ESTIMATED FUNCTIONAL SIZE MEASUREMENT

15.09 [CFP]

2 16.4

Datos Estadísticos Utilización

MMRE	44.7%
DESV STD	18.0%



Rango

Confidencialidad	Min	Max	Unidad
68.26%	12.37	17.80	[CFP]
95.46%	9.66	20.52	[CFP]
99.73%	6.94	23.23	[CFP]

Contexto desarrollado para estimar el tamaño funcional en COSMIC (ISO/IEC 19761) de componentes de software con base en

Ejemplo:

C-Registration System

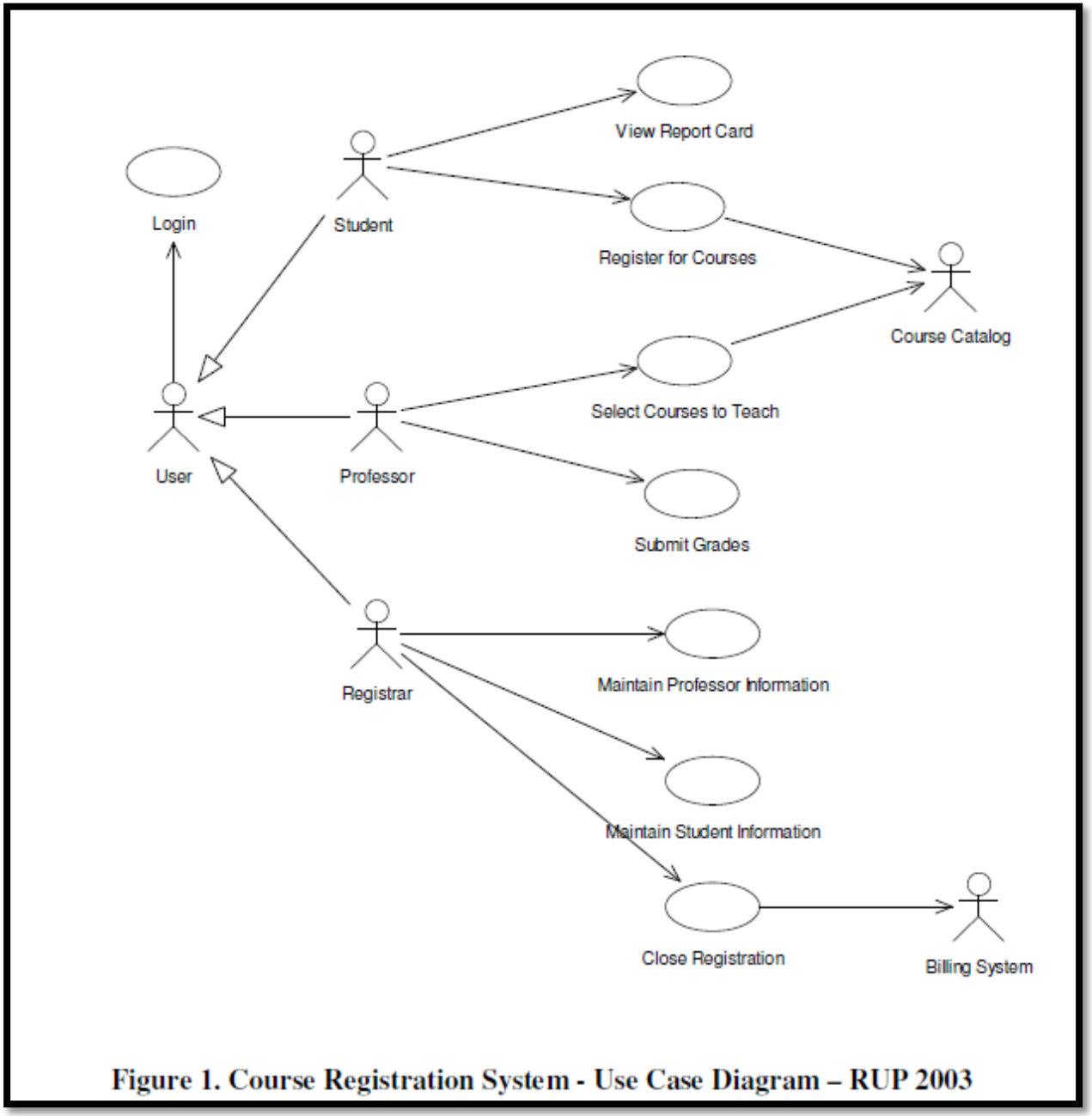


Figure 1. Course Registration System - Use Case Diagram – RUP 2003

Análisis de Datos de Resultados

Table 5. Contribution of functional process to total size (% rounded to the integer)

No	Requirements ID	Functional Processes	CFP	%*
1	1.2	Logon	3	3
2	2.2.1	Add a professor	5	5
3	2.2.2.1	Modify a professor	6	6
4	2.2.2.2	Delete a Professor	6	6
5	3.2	Select Courses to Teach	9	9
6	4.2.1	Add a student	4	4
7	4.2.2.1	Modify a student	6	6
8	4.2.2.2	Delete a Student	6	6
9	5.2.1	Create a schedule	13	13
10	5.2.2.1	Modify a schedule	15	15
11	5.2.2.2	Delete a schedule	7	7
12	7.2	Close registration	9	8
13	8.2	Submit Grades	12	8
14	9.2	View Report Card	6	4
	TOTAL	14	107 CFP	100%

Ejemplo Proyecto Real

		Tamaño	OOI	Aproximación 44.1
1	Autenticación	1	1	5.38
2	Consultar Bandeja de Usuario	3.7	5	44.10
3	Capturar, Editar y Corregir Ficha Nacional de Catálogo	3.5	4.5	44.10
4	Solicitar Validación	3	3	34.20
5	Consulta Contenedor de Fichas	3	4	44.10
6	Validar Ficha	2.5	1	17.64
7	Asignar Ficha para Corrección	2.5	3	33.51
8	Consulta Ficha	3.5	4.5	44.10
9	Eliminar Ficha	2.5	5	44.10
10	Generar Reportes	3.5	4	44.10
				355.33

Invitación y Preguntas

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