

Measurement of
« Business processes »
and
« Functional layers »
using IFPUG FP

Lionel Perrot

Joël André

SEMANTYS

85, rue Pierre Grenier

92100 Boulogne-Billancourt

FRANCE



Measurement of BP and FL using IFPUG PF

Presentation of the issue

Why do we need BP functional measurement ?

Sample statement and measurement as an IFPUG application

BP measurement principles, example and typical use

Why do we need FL functional measurement ?

FL measurement principles

Synthesis



❖ Several well known frameworks exist

- ▶ Zachman, TOGAF, etc.
- ▶ In France, the enterprise architecture (EA) framework is known as an « urbanized model » because the operation of a business is compared to that of a city

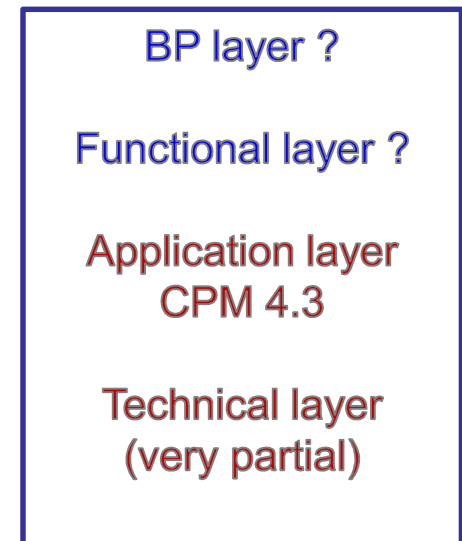
❖ These frameworks and models typically include the following layers

- ▶ Business process layer (BPL)
- ▶ Functional layer (FL)
- ▶ Application layer (AL)
- ▶ Technical layer (TL)

Top-down approach
from user
to
technical infrastructure



- ❖ Historically, the IFPUG approach has focused on measuring the functional size of
 - ▶ New developments
 - ▶ Applications
 - ▶ Enhancement projects
- ❖ Non functional aspects have been addressed by
 - ▶ 14 General System Characteristics and the Adjustment Factor (AF)
 - ▶ Software Non Functional Assessment Process (SNAP)
- ❖ What about the functional measurement of the 2 upper layers ?
 - ▶ What is the functional relationship between the 3 upper layers ?
 - ▶ What are the relevant indicators based on Function Points (FP) to study the 2 upper layers ?



- ❖ Compare the BP in terms of functional size and structure of basic functional components (BFC)
- ❖ Analyze the BP along several axes
 - ▶ Business importance and contribution to the intangible value
 - ▶ What is better ?
 - ▶▶ 1 EO that displays the graph of market share to the sales manager (1 user)
 - ▶▶ 1 EO that displays a quote for an online order (millions of users)
 - ▶ User profiles, # of users of the profile, # of automatized or manual BFC available to each profile
 - ▶ Firing frequency of the BP, effort and time needed to successfully carry out a BFC
 - ▶ Automation rate of the BP

This is not
Statistical Process
Control
(SPC)



❖ Measurement results

- ▶ Know and compare « static functional size » of BP
- ▶ Know and compare the distribution of BFC of BP
 - ▶▶ Example : compare an in-agency loan request and a loan request on a web site
- ▶ Highlight the hierarchy of BP according to the « volumetric functional size »
- ▶ Assess the productivity of BP according to BFC and FP embedded in the BP
- ▶ Evaluate # of users and their profiles based on scenarios

❖ Assess

- ▶ Contribution of automating all or some of the BFC embedded in the BP



❖ Consequences

- ▶ Focus on development and enhancement (investment) and application maintenance (expenditure) that support the best ranked BP
- ▶ Policy of change
 - ▶▶ Estimate workforce profiles and span of control
 - ▶▶ Estimate the effort required to effect change
 - ✓ Preparation of training material, example database and exercices
 - ✓ # of in-class training or e-learning sessions
 - ✓ User's guides, on-line help
 - ✓ Functional support needed for a new BP or a reconfigured BP

❖ Agile company ?

- ▶ Feasability of reconfiguring the company



- ❖ We provide an example
 - ▶ Statement describing a very simple BP
 - ▶ Reminder of IFPUG principles, followed by the application for the functional measurement of the example
 - ▶ Proposal of principles for BP functional measurement. Measurement of « static size » and « volumetric size » of the BP
 - ▶ Example of an estimate effort based on indicators that we have built during our experiments

 - ▶ Usefulness of functional measurement of the FL
 - ▶ Proposal of principles for FL functional measurement
 - ▶▶ The results of FL measurement are given in annex



❖ Incoming mail BP: user U1

- ▶ An employee U1 takes a letter, opens the letter and verifies the documents that are in the letter
- ▶ U1 searches the relevant item in the management file using the function "simplified list of items" in the application "File Management ". This function references also the " Customer File ".

If the relevant item is found and it matches the content of the letter then

- ▶▶ U1 scans the document(s) of the letter
 - ▶▶ U1 displays the « simplified view » of the relevant item and associates the scan(s) to the relevant item
 - ▶▶ U1 displays again the "simplified list of items" to verify that the state of the relevant item has changed
 - ▶▶ U1 puts the documents in the letter, puts the letter in a locker corresponding to the new status of the letter and the item
- ▶ If the relevant item is not found or it does not match the content of the letter then U1 puts the documents in the envelope, puts the letter in a locker for the employee U2
 - ▶ Then U1 takes the next letter



❖ Incoming mail BP: user U2

- ▶ Employee U2 opens the letter and studies the documents that are in the letter
- ▶ U2 searches the relevant item in the management file using the function “complex list of items” in the application “File Management”. This function references also the “Customer File”.
- ▶ If the relevant item is found and it matches the content of the letter
 - ▶▶ U2 scans the document(s) of the letter
 - ▶▶ U2 displays the « detailed view » of the relevant item and associates the scan(s) to the relevant item
 - ▶▶ U2 puts the documents in the letter, puts the letter in a locker corresponding to the new status of the letter and the item
- ▶ If the relevant item is not found or it does not match the content of the letter then
 - ▶▶ U2 puts the documents in the letter, puts the letter in a locker where the letter can be recycled or reprocessed by another BP within one month
 - ▶▶ After one month, a third BP produces a microfiche backup before shredding the letter
- ▶ Then U2 takes the next letter



❖ Application boundary

- ▶ Conceptual interface between the system under study and its users

❖ Counting scope

- ▶ Defines the set of Functional User Requirements to be included in the function point count

❖ Data functions

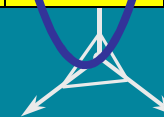
- ▶ Are counted only once within the same application even if the technical solution leads to the implement several times
- ▶ Are counted once as ILF in every applications which maintain them
- ▶ Are counted once as EOF in every applications which reference them without maintaining them

❖ Transactional functions

- ❖ Are counted only once within the same application even if the technical solution leads to the implement several times
- ▶ Are counted once as EI, EO, EQ in every applications where they provide functionality to the user



user	action & transaction	abbrev	IFPUG type	manual (y/n)	state ment FP	AL FP
U1	verifies the document(s)	verif1		yes		
U1	simplified list of items	list11	EI	no	3	3
U1	simplified view of item	view1	EQ	no	3	3
U1	scan document(s)	scan1	EO	no	4	4
U1	associate scan to item	assoc1	EI	no	3	3
U1	simplified list of items	list12	EQ	no	3	= list11
U1	put letter in locker	put1		yes		
U2	study the document(s)	study2		yes		
U2	complex list of items	list2	EQ	no	4	4
U2	detailed view of item	view2	EQ	no	6	6
U2	scan document(s)	scan2	EO	no	4	= scan1
U2	associate scan to item	assoc2	EI	no	3	= assoc1
U2	put letter in locker	put2		yes		
U1 & U2	TOTAL action & transaction		9	4	33	23
U1 & U2	Percentages			31%	143%	100%



user	tank & data	abbrev	IFPUG type	manual (y/n)	state ment FP	AL FP
U1	Management file	mngF1	ILF	no	15	15
U1	Customer file	custF1	EIF	no	10	10
U1	Locker	lockT1		yes		
U2	Management file	mngF2	ILF	no	15	= mngF1
U2	Customer file	custF2	EIF	no	10	= custF1
U2	Locker	lockT2		yes		
U1 & U2	TOTAL tank & data		4	2	50	25
U1 & U2	Percentages			33%	200%	100%
U1 & U2	TOTAL U1 & U2		13	6	83	48
U1 & U2	Percentages			40%	173%	100%

- ❖ Elementary processes (EP) “list the items” and “view the items” triggered by U1 and U2 are counted twice as they do not obey the same processing logic
- ❖ Elementary processes “scan” and “associate” triggered by U1 and U2 are counted only once as they obey the same processing logic



❖ Boundary

- ▶ Conceptual or physical interface between a BP and other BP within the organization or outside the organization

❖ Counting scope

- ▶ Operations or tasks performed by the same actor or different actors in different temporal and/or spatial contexts within a BP

❖ Functional data and tanks

- ▶ Are counted as ILF or EIF, once a BP. They are categorized as manual or automatic
Example: "Locker" is a manual ILF (tank) and "Customer File" is a automated EIF (functional data)

Actions and transactions

- ▶ Are counted as EI, EO, EQ whenever they are triggered by an actor within the BP. They are categorized as manual or automatic
Example : " U1 puts the letter in a locker " : manual EI (action)
- ▶ Example : " U1 displays the « simplified view » of the relevant item " : automated EQ (transaction)



user	action & transaction	abbrev	IFPUG type	manual (y/n)	BPL FP	U1 FP	U2 FP	manu al FP	auto FP
U1	verifies the document(s)	verif1	EQ	yes	3	3		3	
U1	simplified list of items	list11	EI	no	3	3			3
U1	simplified view of item	view1	EQ	no	3	3			3
U1	scan document(s)	scan1	EO	no	4	4			4
U1	associate scan to item	assoc1	EI	no	3	3			3
U1	simplified list of items	list12	EQ	no	3	3			3
U1	put letter in locker	put1	EI	yes	3	3		3	
U2	study the document(s)	study2	EQ	yes	3		3	3	
U2	complex list of items	list2	EQ	no	4		4		4
U2	detailed view of item	view2	EQ	no	6		6		6
U2	scan document(s)	scan2	EO	no	4		4		4
U2	associate scan to item	assoc2	EI	no	3		3		3
U2	put letter in locker	put2	EI	yes	3		3	3	
U1 & U2	TOTAL action & transaction		13	4	45	22	23	12	33
U1 & U2	Percentages			31%	100%	49%	51%	27%	73%



Example measurement BP tanks, data function & sum

user	tank & data	abbrev	IFPUG type	manual (y/n)	BPL FP	U1 FP	U2 FP	manu al FP	auto FP
U1	Management file	mngF1	ILF	no	15	15			15
U1	Customer file	custF1	EIF	no	10	10			10
U1	Locker	lockT1	ILF	yes	7	7		7	
U2	Management file	mngF2	ILF	no	= mngF1		15		= mngF1
U2	Customer file	custF2	EIF	no	= custF1		10		= custF1
U2	Locker	lockT2	ILF	yes	= lockT1		7	= lockT1	
U1 & U2	TOTAL tank & data		6	2	32	32	32	7	25
U1 & U2	Percentages			33%	100%	100%	100%	22%	78%

U1 & U2	TOTAL U1 & U2		19	6	77	54	55	19	58
U1 & U2	Percentages			32%	100%	70%	71%	25%	75%

- ❖ Actions and transactions are recounted whenever they are triggered by an actor
- ❖ Do not recount the tanks and functional data within the same BP



❖ Incoming mail BP: user U1

U1 opens 50
letters per day

- ▶ An employee U1 takes a letter, opens the letter and verifies the documents that are in the letter
- ▶ U1 searches the relevant item in the management file using the function "simplified list of items" in the application "File Management ". This function references also the " Customer File ".

If the relevant item is found and it matches the content of the letter then

- ▶▶ U1 scans the document(s) of the letter
 - ▶▶ U1 displays the « simplified view » of the relevant item and associates the scan(s) to the relevant item
 - ▶▶ U1 displays again the "simplified list of items" to verify that the state of the relevant item has changed
 - ▶▶ U1 puts the documents in the letter, puts the letter in a locker corresponding to the new status of the letter and the item
- ▶ If the relevant item is not found or it does not match the content of the letter then U1 puts the documents in the envelope, puts the letter in a locker for the employee U2
 - ▶ Then U1 takes the next letter

U1
Finds 38
Relevant
items per day

U1
12 relevant items not found per day



❖ Incoming mail BP: user U2

U2 opens
12 letters per
day

- ▶ Employee U2 opens the letter and studies the documents that are in the letter
- ▶ U2 searches the relevant item in the management file using the function “complex list of items” in the application “File Management”. This function references also the “Customer File”.
- ▶ If the relevant item is found and it matches the content of the letter
 - ▶▶ U2 scans the document(s) of the letter
 - ▶▶ U2 displays the « detailed view » of the relevant item and associates the relevant item
 - ▶▶ U2 puts the documents in the letter, puts the letter in a locker corresponding to the new status of the letter and the item
- ▶ If the relevant item is not found or it does not match the content of the letter then
 - ▶▶ U2 puts the documents in the letter, puts the letter in a locker where the letter can be recycled or reprocessed by another BP within one month
 - ▶▶ After one month, a third BP produces a microfiche backup before shredding the letter
- ▶ Then U2 takes the next letter

U2
finds 8
relevant
items per day

U2
4 relevant items not
found per day



user	abbrev	BPL FP	# per day	vol FP	U1 vol FP	U2 vol FP	manual vol FP	auto vol FP
U1	verif1	3	50	150	150		150	
U1	list11	3	50	150	150			150
U1	view1	3	38	114	114			114
U1	scan1	4	38	152	152			152
U1	assoc1	3	38	114	114			114
U1	list12	3	38	114	114			114
U1	put1	3	50	150	150		150	
U2	study2	3	12	36		36	36	
U2	list2	4	12	48		48		48
U2	view2	6	8	48		48		48
U2	scan2	4	8	32		32		32
U2	assoc2	3	8	24		24		24
U2	put2	3	12	36		36	36	
U1 & U2	Total	45	362	1168	944	224	372	796
U1 & U2	Percentages			100%	81%	19%	32%	68%
U1 & U2	Statical size			45	22	23	12	33
U1 & U2	Statical size / vol size			4%	2%	10%	3%	4%

❖ We are interested in the # of actions and transactions



❖ Average user's time to run 1 PF in area of management (rounded)

- ▶ Repetitive work, data entry without initiative, standard profile (Ex: U1): 25 seconds
- ▶ Variable work, statistically predictable, data entry with decision making, experienced profile (Ex: U2): 50 seconds
- ▶ Unpredictable work, unforeseen information retrieval processes, expert profile: 80 seconds

$$\text{Sizing} = \frac{(\# \text{ of FP given to the user }) * (\text{annual frequency}) * (\text{running time of 1 FP})}{\# \text{ of minutes worked during 1 year}}$$

❖ Average ratio between the time to run 1 manual PF and the time to run 1 automated PF regardless of profile (rounded)

EI : + 40%
EO : + 80 %
EQ : + 50 %

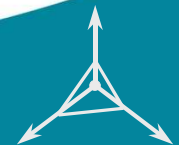
❖ The actions and transactions triggered less than 2 times a month are poorly mastered and have higher running time (quarterly treatment, annual treatment, and especially in a crisis situation)



user	abbrev	sec per FP	BPL FP	manual rate	sec per action	# transac per day	total sec per day	U1 sec per day	U2 sec per day	# manual sec per day	# auto sec per day
U1	verif1	25	3	150%	112,5	50	5625	5625		5625	
U1	list11	25	3		75	50	3750	3750			3750
U1	view1	25	3		75	38	2850	2850			2850
U1	scan1	25	4		100	38	3800	3800			3800
U1	assoc1	25	3		75	38	2850	2850			2850
U1	list12	25	3		75	50	3750	3750			3750
U1	put1	25	3	140%	105	50	5250	5250		5250	
U2	study2	50	3	150%	225	12	2700		2700	2700	
U2	list2	50	4		200	12	2400		2400		2400
U2	view2	50	6		300	8	2400		2400		2400
U2	scan2	25	4		100	8	800		800		800
U2	assoc2	25	3		75	8	600		600		600
U2	put2	25	3	140%	105	12	1260		1260	1260	
U1 & U2	Total		45		124,81	374	38035	27875	10160	14835	23200
U1 & U2	Percentages						100%	73%	27%	39%	61%

Is a working day enough ?

❖ Sizing workforce



- ❖ # of available FP for a profile working in several management fields
 - ▶ Max = 1200 automated FP for a good productivity

Does not take into account support transactions (login, logout, trace, help, etc.)

- ❖ Actual BP sizes vary from 50 to 650 automated FP (rounded)
 - ▶ A BP sizing more than 500 FP must be split into smaller BPs



❖ Estimate the effort required to effect change

- ▶ Management. Change the information system without changing the BP
 - ▶▶ Prepare the instructional material from the running application : 130 FP a day
 - ▶▶ In-class training sessions : learn 400 FP a day
- ▶ Management. Change the information system while changing the BP
 - ▶▶ In-class training sessions : learn 230 FP a day
- ▶ Expert profile, decision making in uncertain context : important standard deviation

Estimate trainer effort (# of sessions)

$$\frac{(\# \text{ of FP to learn}) * (\text{workforce})}{(\# \text{ of FP learned per day}) * (\# \text{ of learners / session})}$$



- ❖ Virtual layer whose contents are controlled by functional architects
- ❖ Used to
 - ▶ Project optimally the BPL in the AL
 - ▶ Re-balance the functional blocks based on strategic priorities
 - ▶▶ Ex: Does the ratio (marketing FP) / (design FP) correspond to the priorities set by the directions ?
- ❖ Consequences
 - ▶ Strategic alignment
 - ▶▶ Development of master plans (5 years) and medium-term scenarios (3 years)
 - ▶▶ Budgeting the functional blocks in term of FP
Ex: 800 FP/ year for 5 years in the CRM
 - ▶ Use the functional layer for streamlining the application portfolio
 - ▶▶ Remove of duplicate, triplets
 - ▶▶ Pool reference data
 - ▶▶ Implement reusable services



❖ Boundary

- ▶ Logical boundary between functional blocks described by functional architects

❖ Counting scope

- ▶ Logical union of functional user requirements (humans and artifacts). Ideally, remove redundancies within the information system

❖ Data function

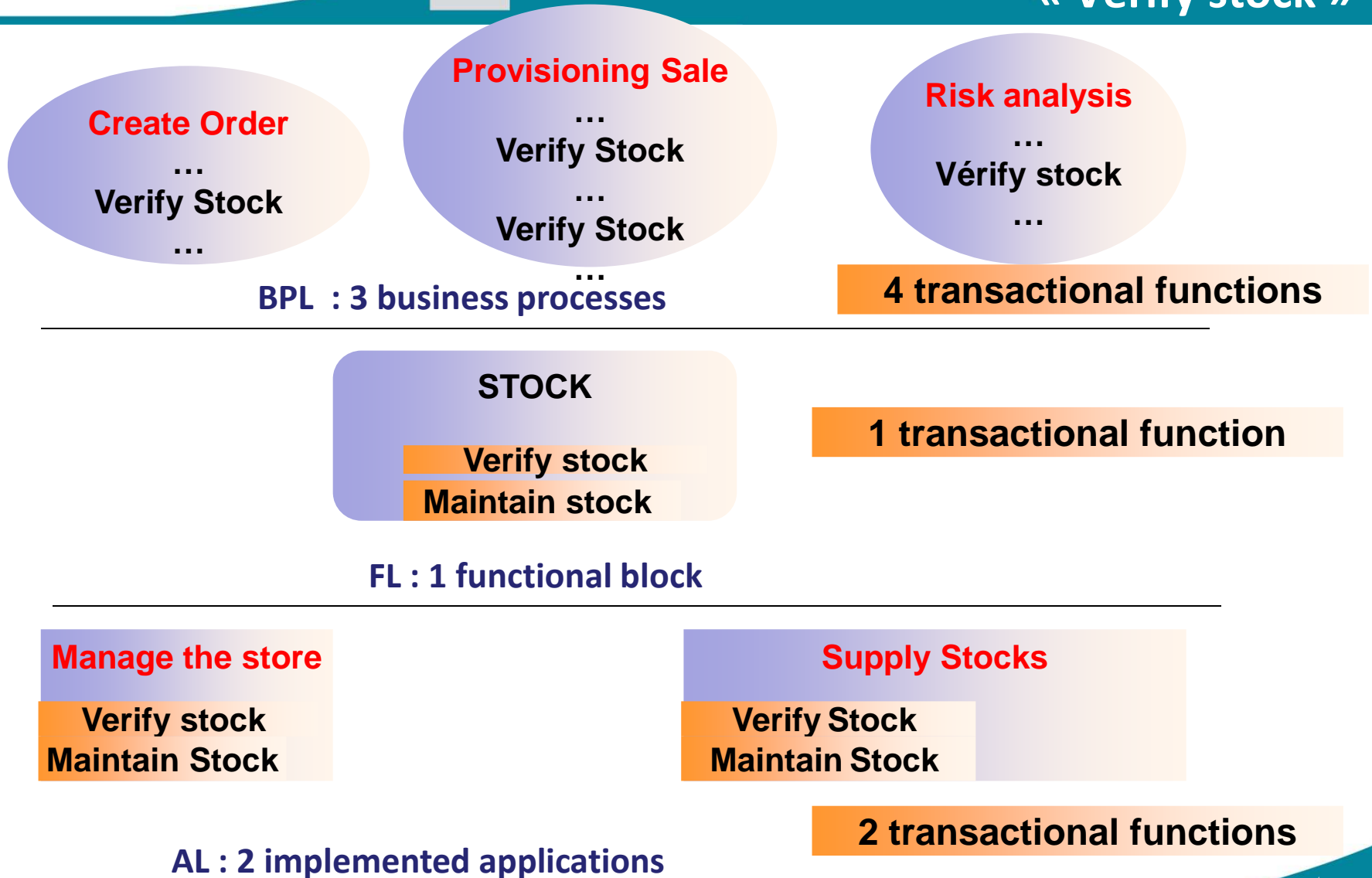
- ▶ By construction, they are counted only once as an ILF within 1 unique functional block, even if they are maintained by multiple applications. They are counted as EIF for all functional blocks that reference them

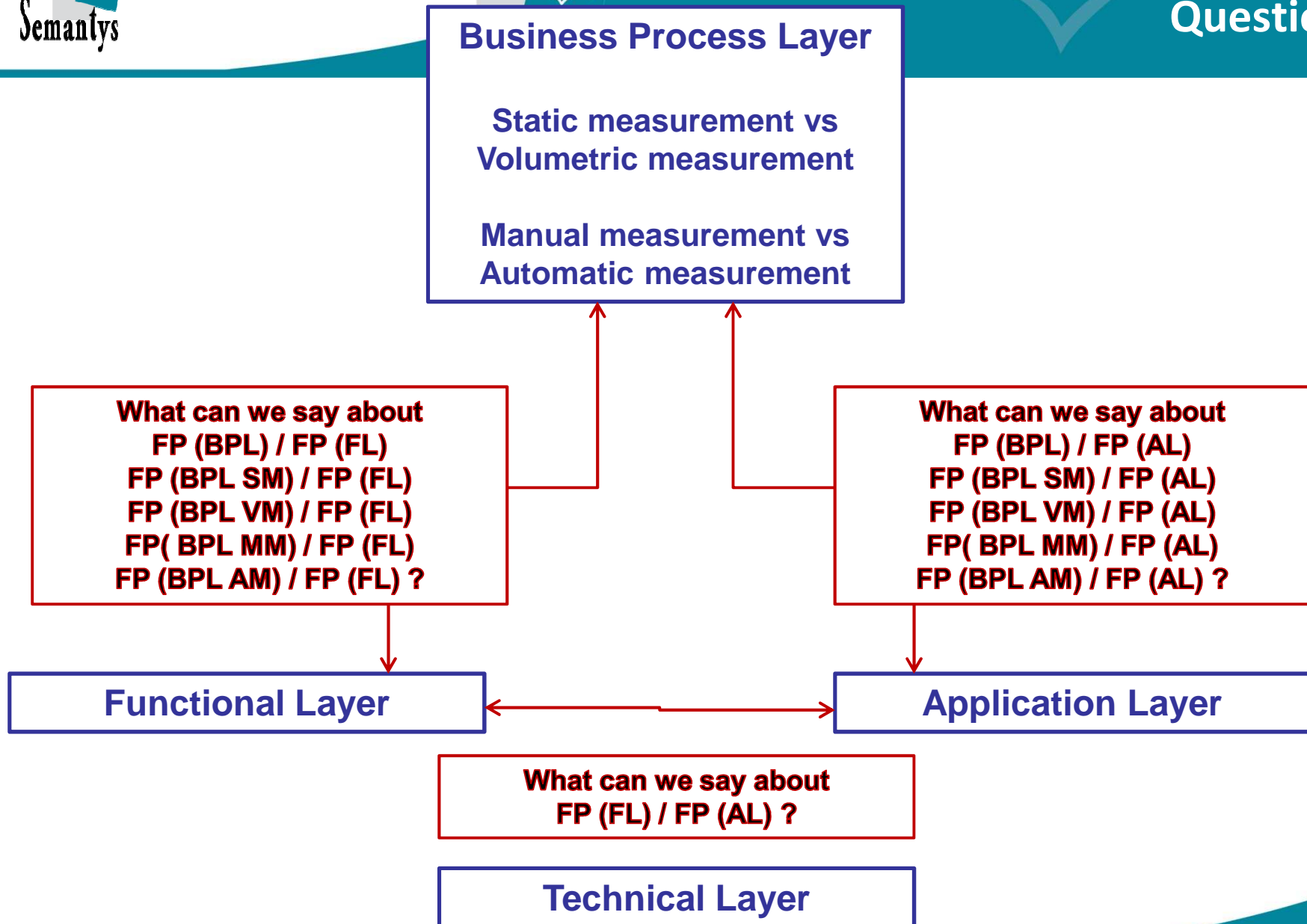
❖ Transactional function

- ▶ Are counted only once within 1 unique functional block, even if they are made available by several applications, even if they are implemented several times within one or more applications



Example of transactional function « Verify stock »





- ❖ Enterprise architecture frameworks typically include the following layers
 - ▶ Business Process Layer (BPL), Functional Layer (FL), Application Layer (AL) and Technical Layer (TL)

- ❖ We propose using the IFPUG FP to measure functional size of the BPL and the FL
 - ▶ We present
 - ▶▶ Purposes, principles, examples and uses of BPL and FL measurements
 - ▶▶ Actual results coming from our work in management area

- ❖ Currently conducting further studies to
 - ▶ Improve our indicators while taking into account the users profiles
 - ▶ Extend this method to other areas



Questions ...

and Answers !



user	action & transaction	abbrev	IFPUG type	manual (y/n)	state ment FP	AL FP	FL FP
U1	verifies the document(s)	verif1		yes			
U1	simplified list of items	list11	EI	no	3	3	3
U1	simplified view of item	view1	EQ	no	3	3	3
U1	scan document(s)	scan1	EO	no	4	4	4
U1	associate scan to item	assoc1	EI	no	3	3	3
U1	simplified list of items	list12	EQ	no	3	= list11	= list11
U1	put letter in locker	put1		yes			
U2	study the document(s)	study2		yes			
U2	complex list of items	list2	EQ	no	4	4	= list11
U2	detailed view of item	view2	EQ	no	6	6	= view1
U2	scan document(s)	scan2	EO	no	4	= scan1	= scan1
U2	associate scan to item	assoc2	EI	no	3	= assoc1	= assoc1
U2	put letter in locker	put2		yes			
U1 & U2	TOTAL action & transaction		9	4	33	23	13
U1 & U2	Percentages			31%	254%	177%	100%

❖ Logical union of all users' views



user	tank & data	abbrev	IFPUG type	manual (y/n)	state ment FP	AL FP	FL FP
U1	Management file	mngF1	ILF	no	15	15	15
U1	Customer file	custF1	ILF or EIF	no	10	10	15
U1	Locker	lockT1		yes			
U2	Management file	mngF2	ILF	no	15	= mngF1	= mngF1
U2	Customer file	custF2	ILF or EIF	no	10	= custF1	= custF1
U2	Locker	lockT2		yes			
U1 & U2	TOTAL tank & data		4	2	50	25	30
U1 & U2	Percentages			33%	167%	83%	100%
U1 & U2	TOTAL U1 & U2		13	6	83	48	43
U1 & U2	Percentages			32%	193%	112%	100%

❖ Logical union of all users' views



Lionel PERROT
LPerrot@semantys.com

IFPUG CFPS

Member of the board of ASSEMI
(Association française pour l'étude des métriques informatiques)

Ph.D (Paris 6 Jussieu)
MBA (IAE Paris 1 La Sorbonne)

- ❖ Thanks to Joël André
- ❖ JAndre@semantys.com

