Identification of the participant

- Participant Name: Daniel Ferreira Polónia
- Academic Degree: PhD
- Academic Institution: Universidade de Aveiro/Aveiro University
- Academic Course: Engenharia Electrotécnica/Electrotechnical Engineering
- Thesis Title: Mercado Electrónico para Serviços de Teleradiologia/Electronic marketplace for teleradiology services
- Thesis Supervisor: Prof. Doutor Manuel Oliveira Duarte/Prof. Doutor José Luís Guimarães Oliveira
- Current Thesis Status: Officially concluded
- Thesis Final Grade: Approved

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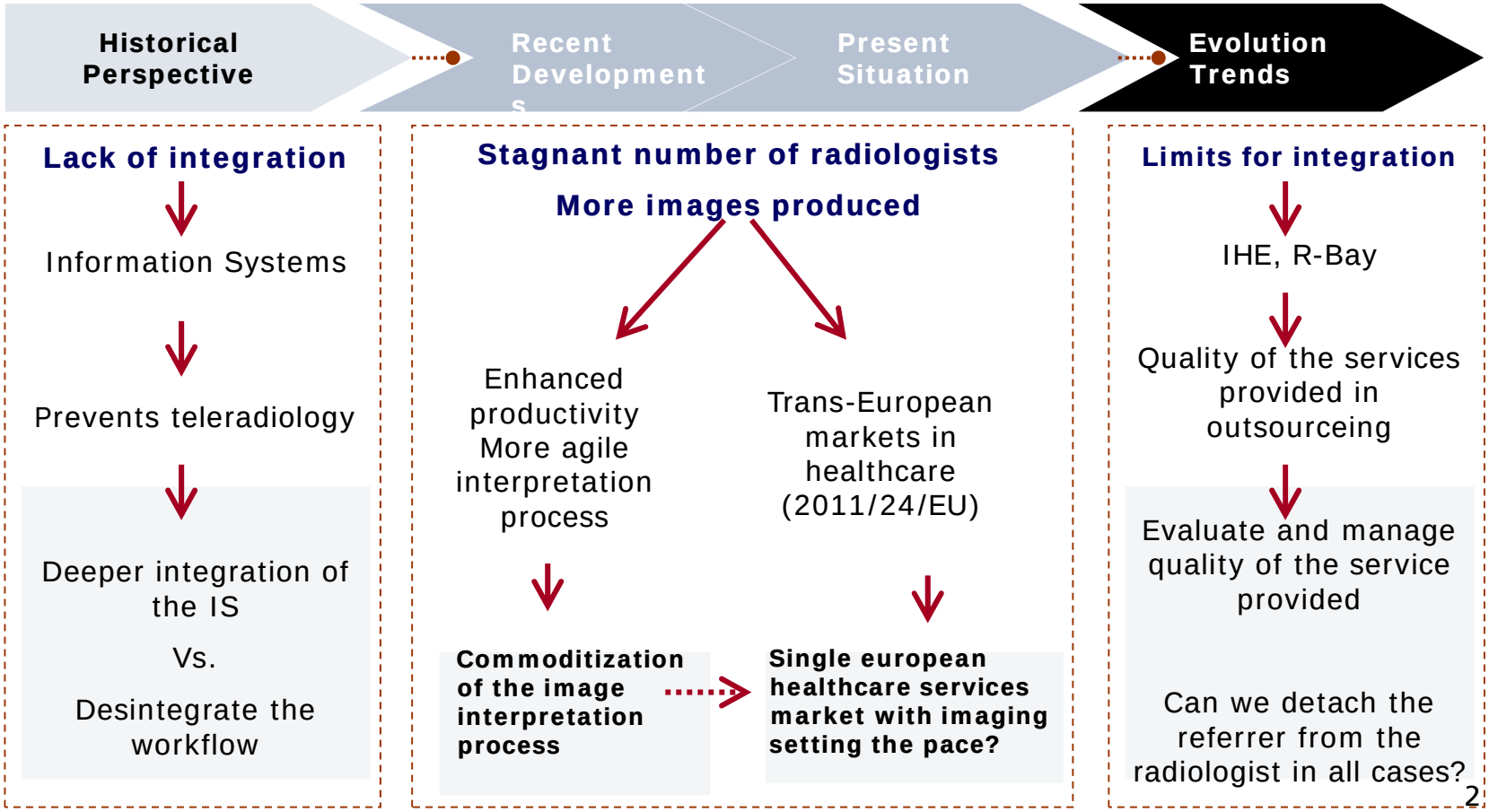
Problem identification (1/2)

Challenges and trends in teleradiology



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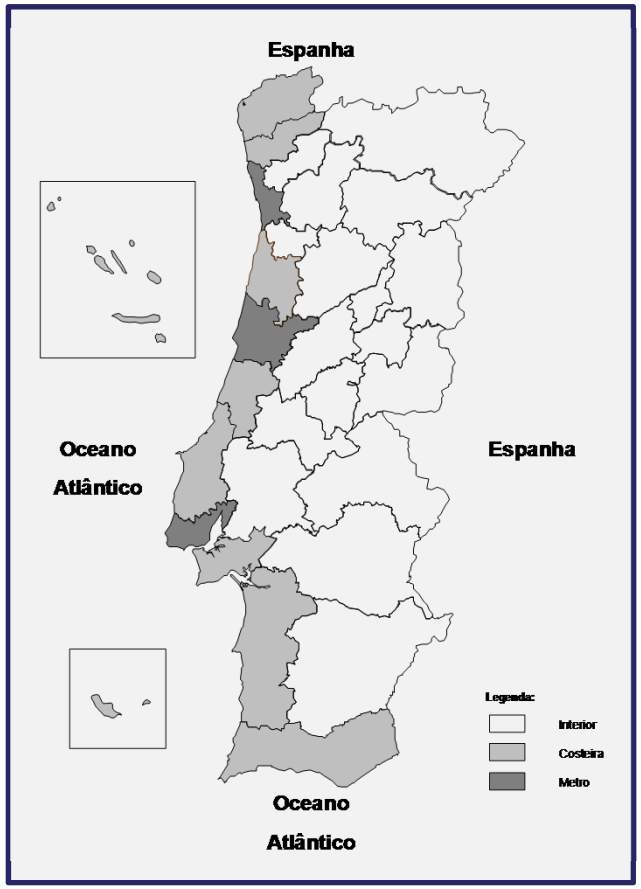
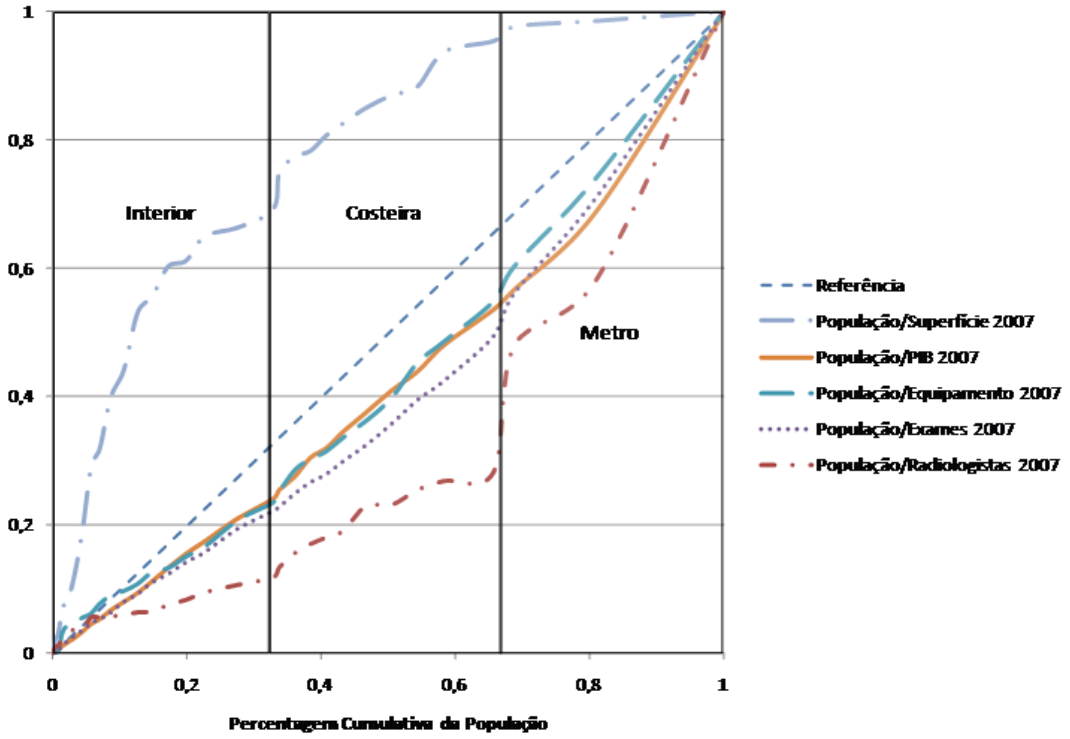
Problem identification (2/2)

Status quo in Portugal





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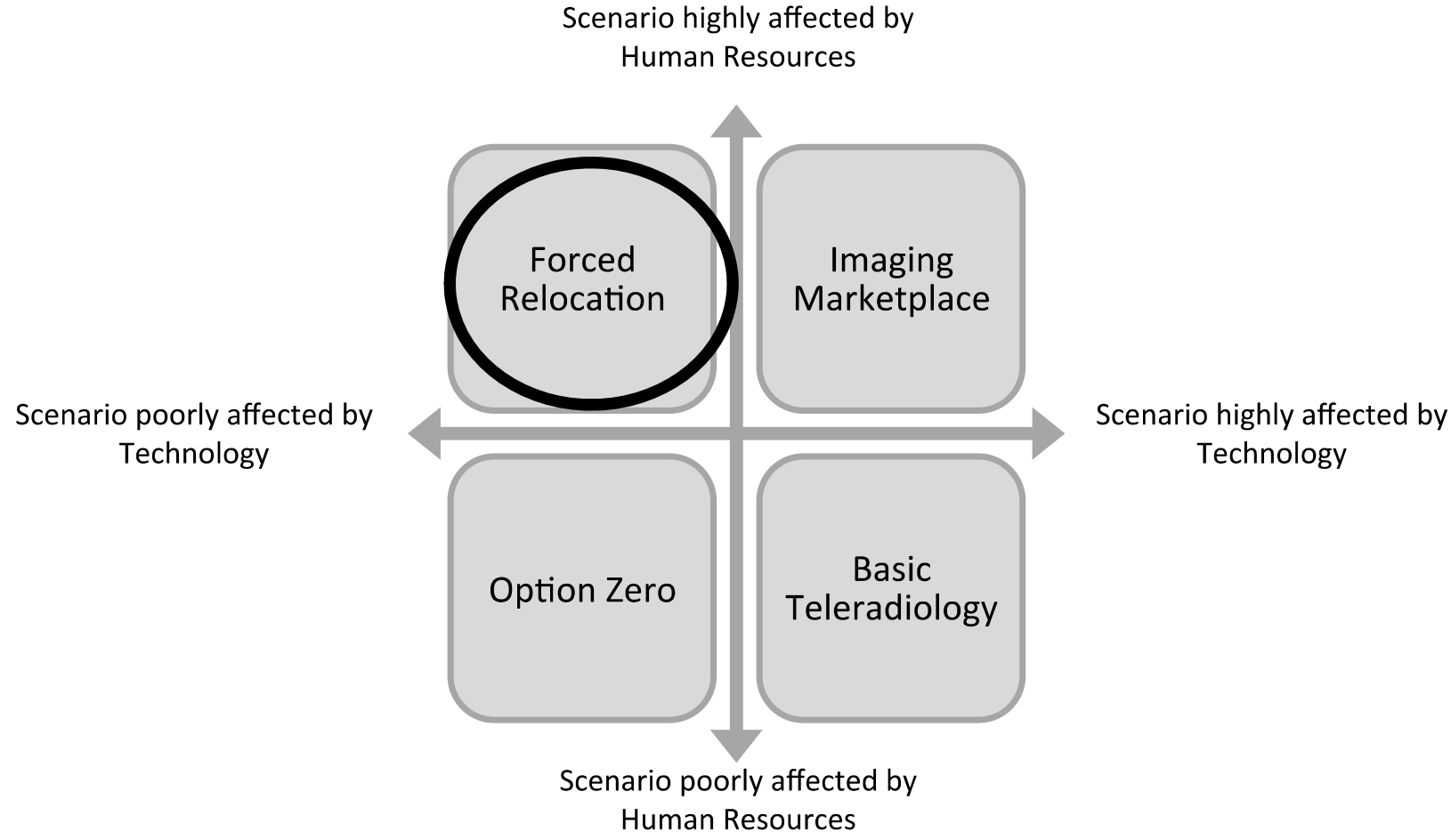
Main solution to problem

Imaging Marketplace



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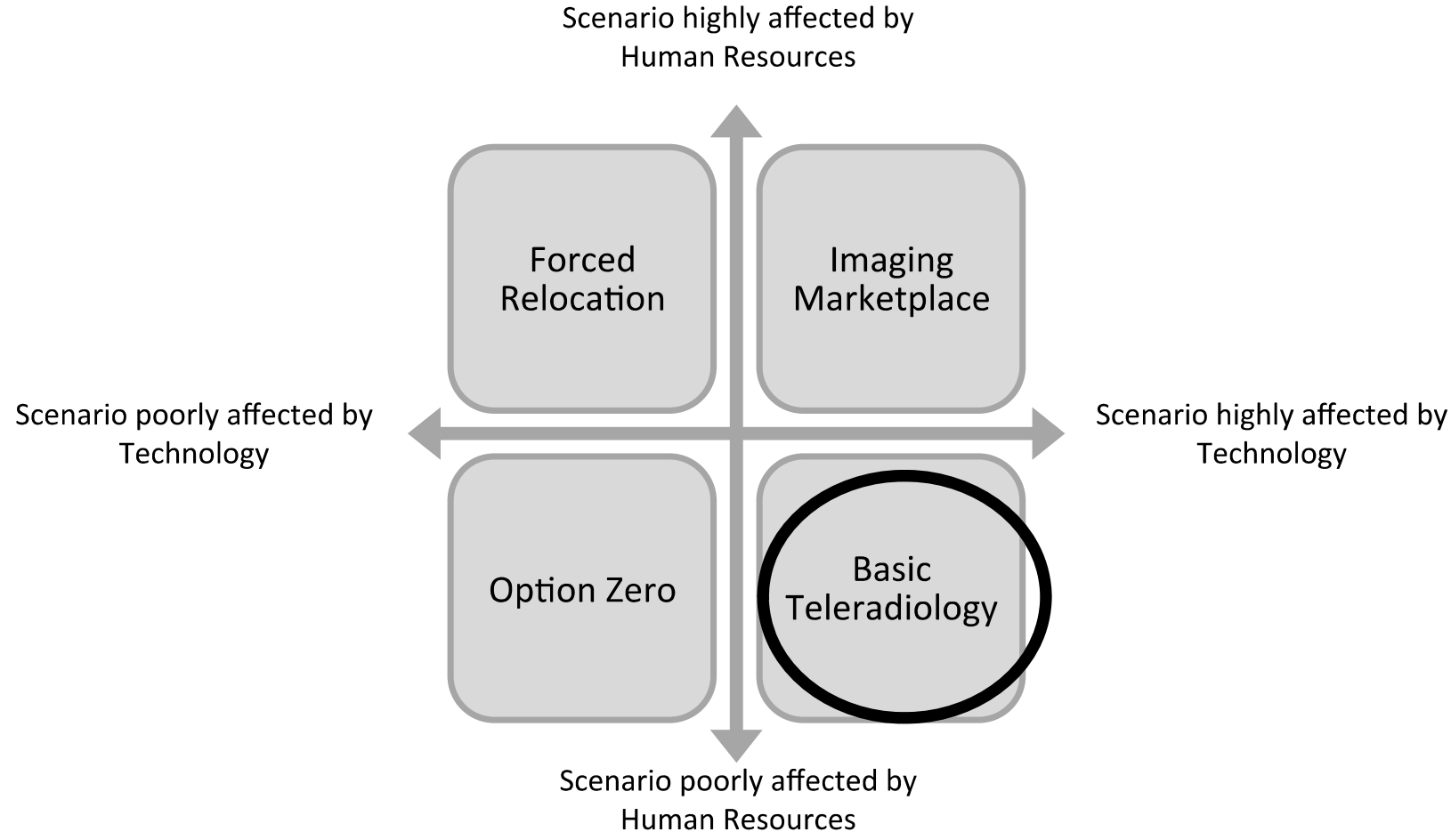
Main solution to problem

Imaging Marketplace



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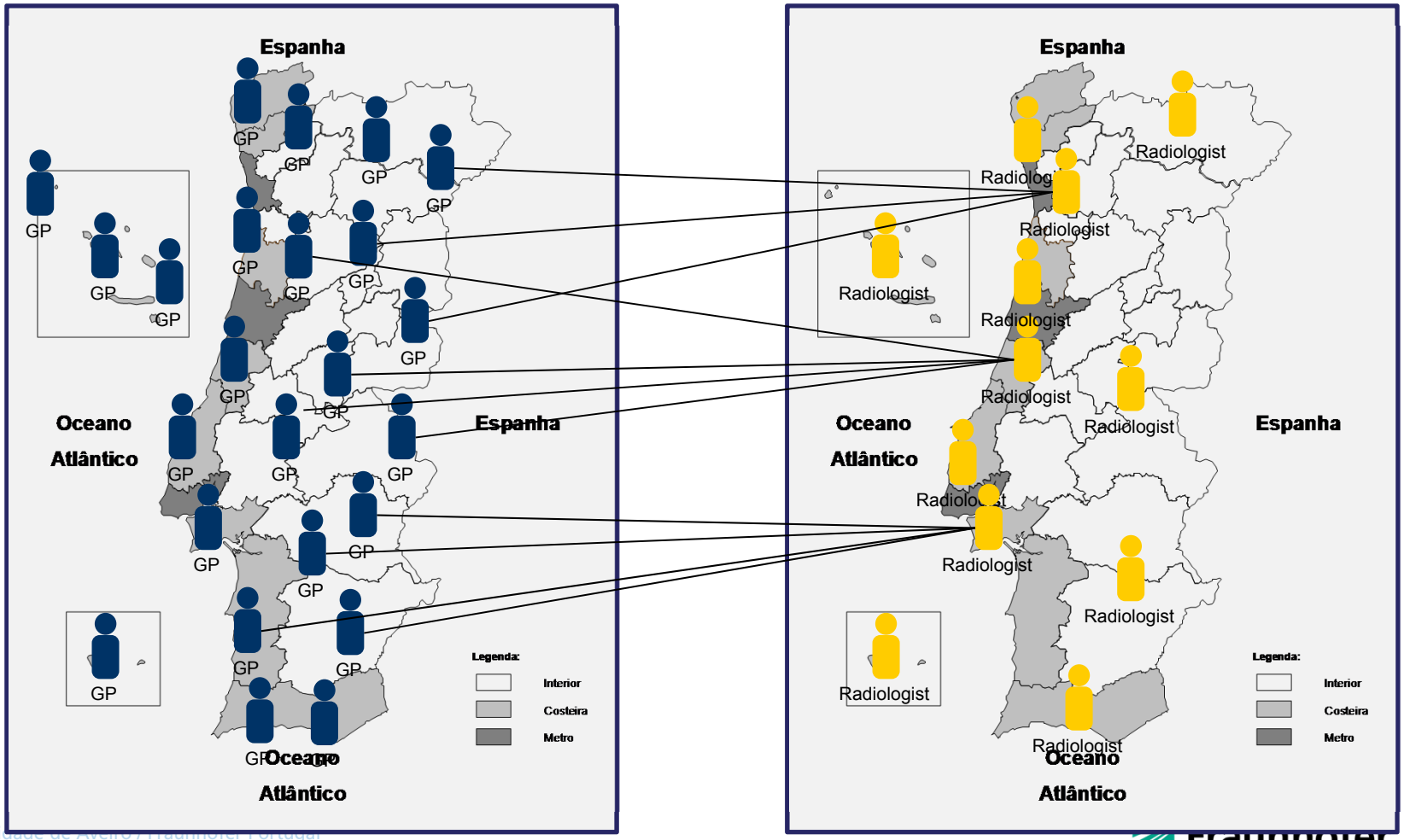
Main solution to problem

Possible solutions



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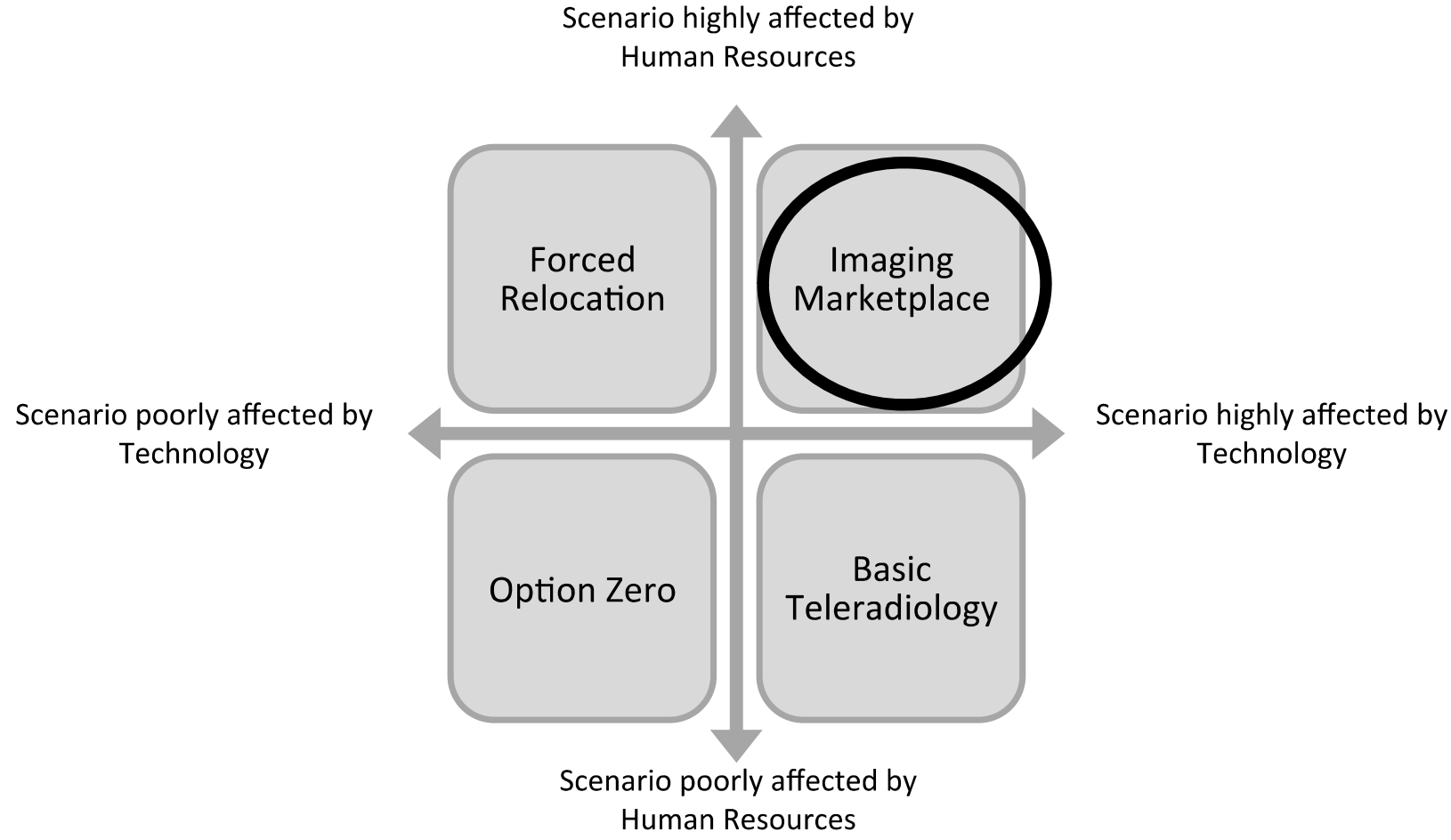
Main solution to problem

Imaging Marketplace



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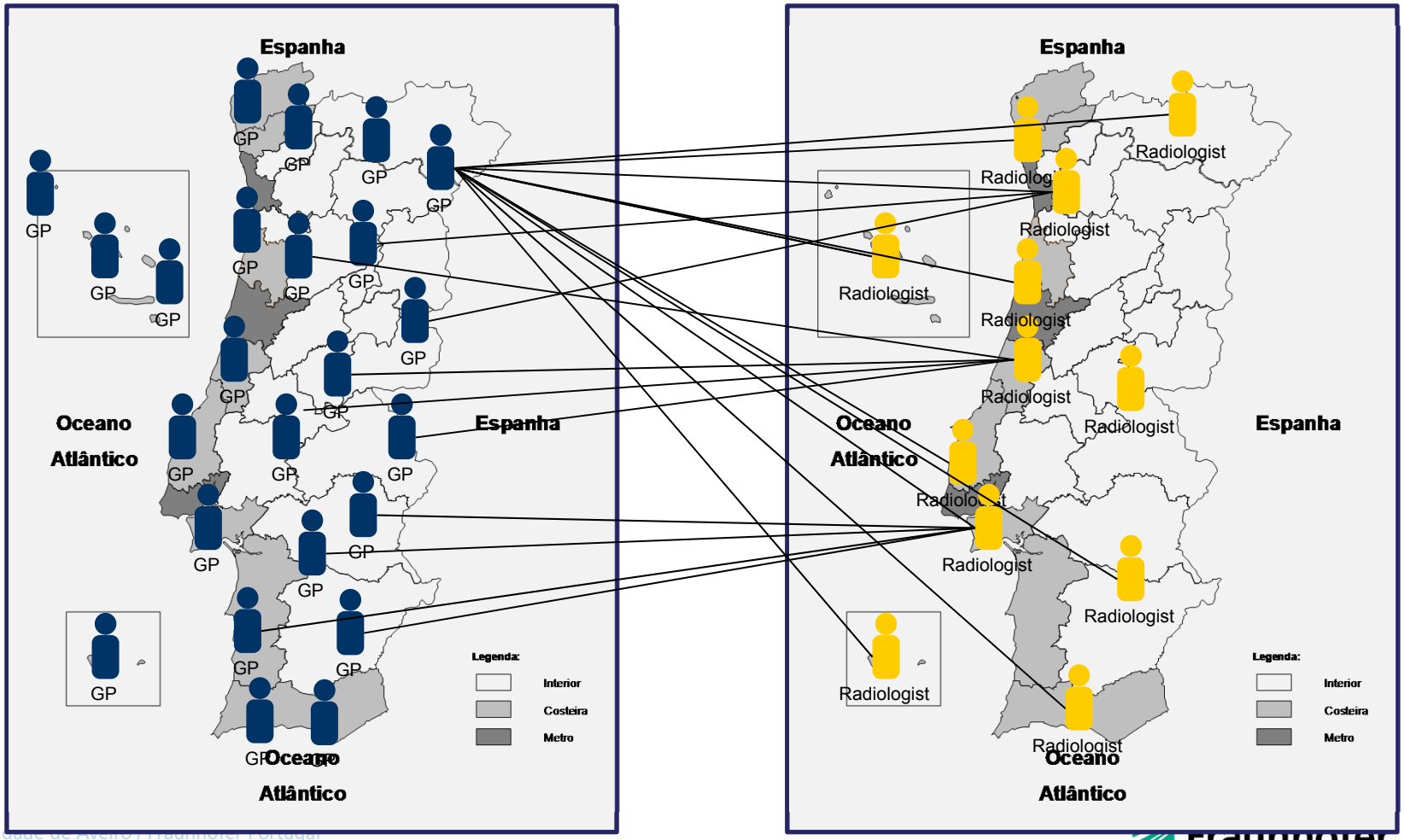
Main solution to problem

Imaging Marketplace



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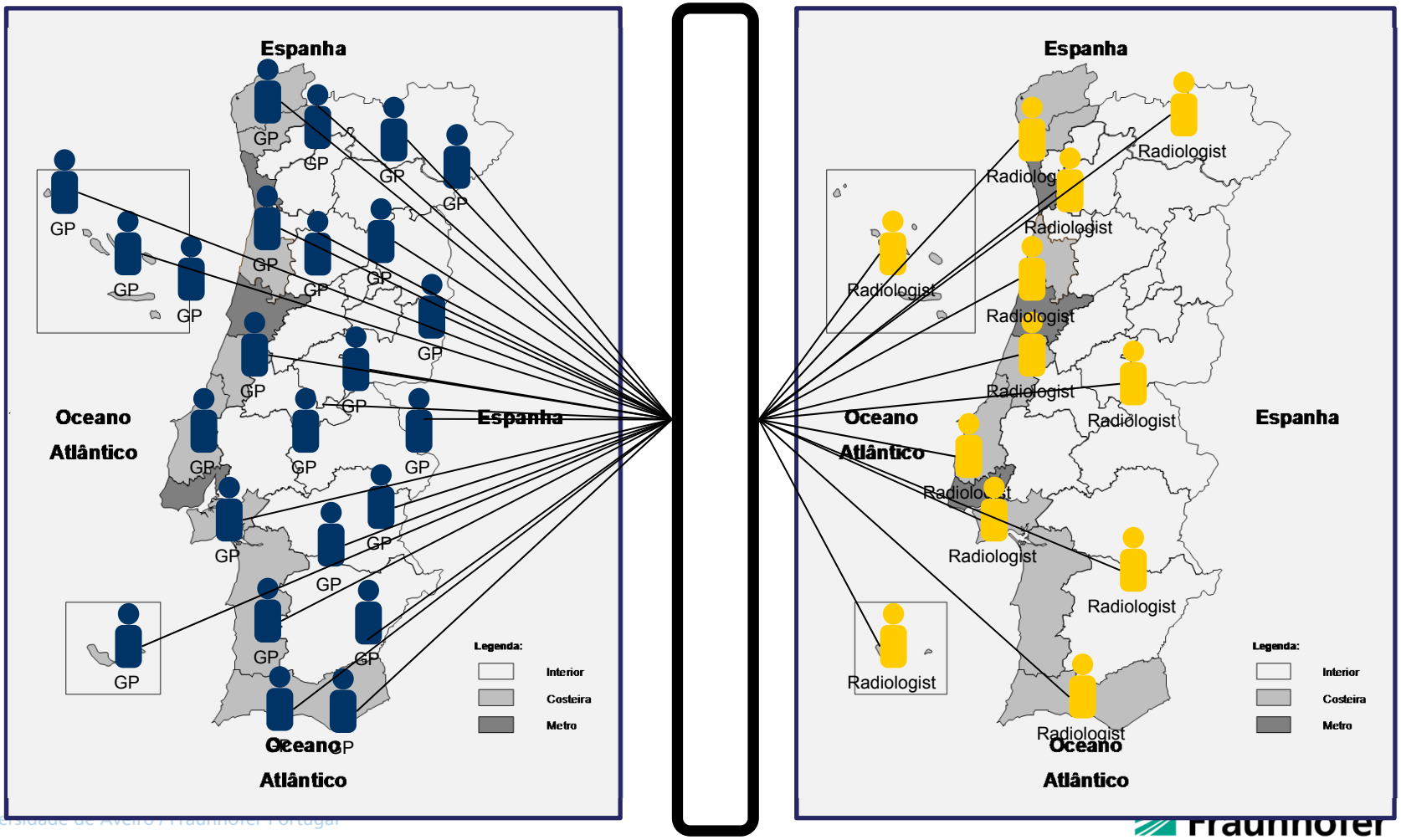
Main solution to problem

Imaging Marketplace



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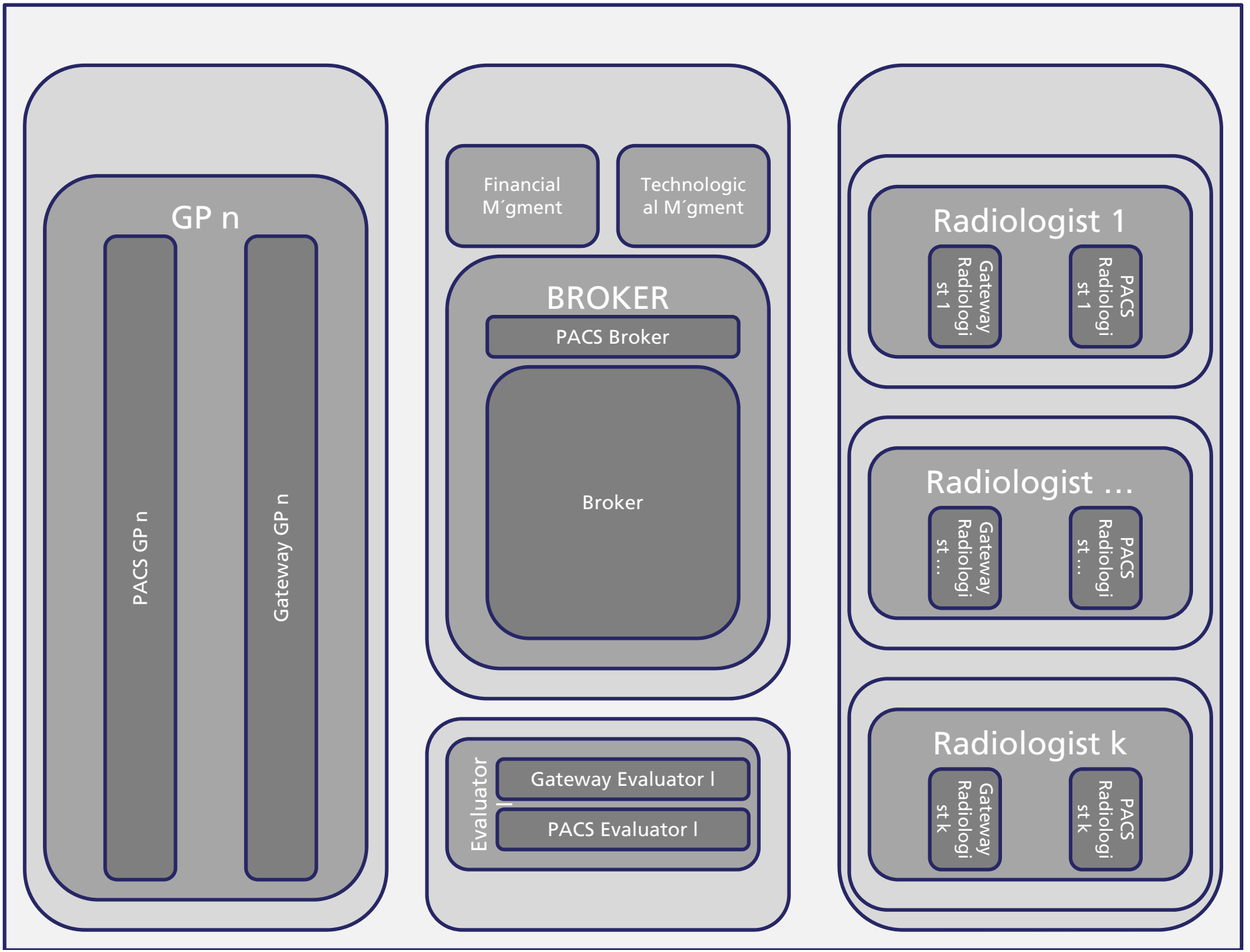
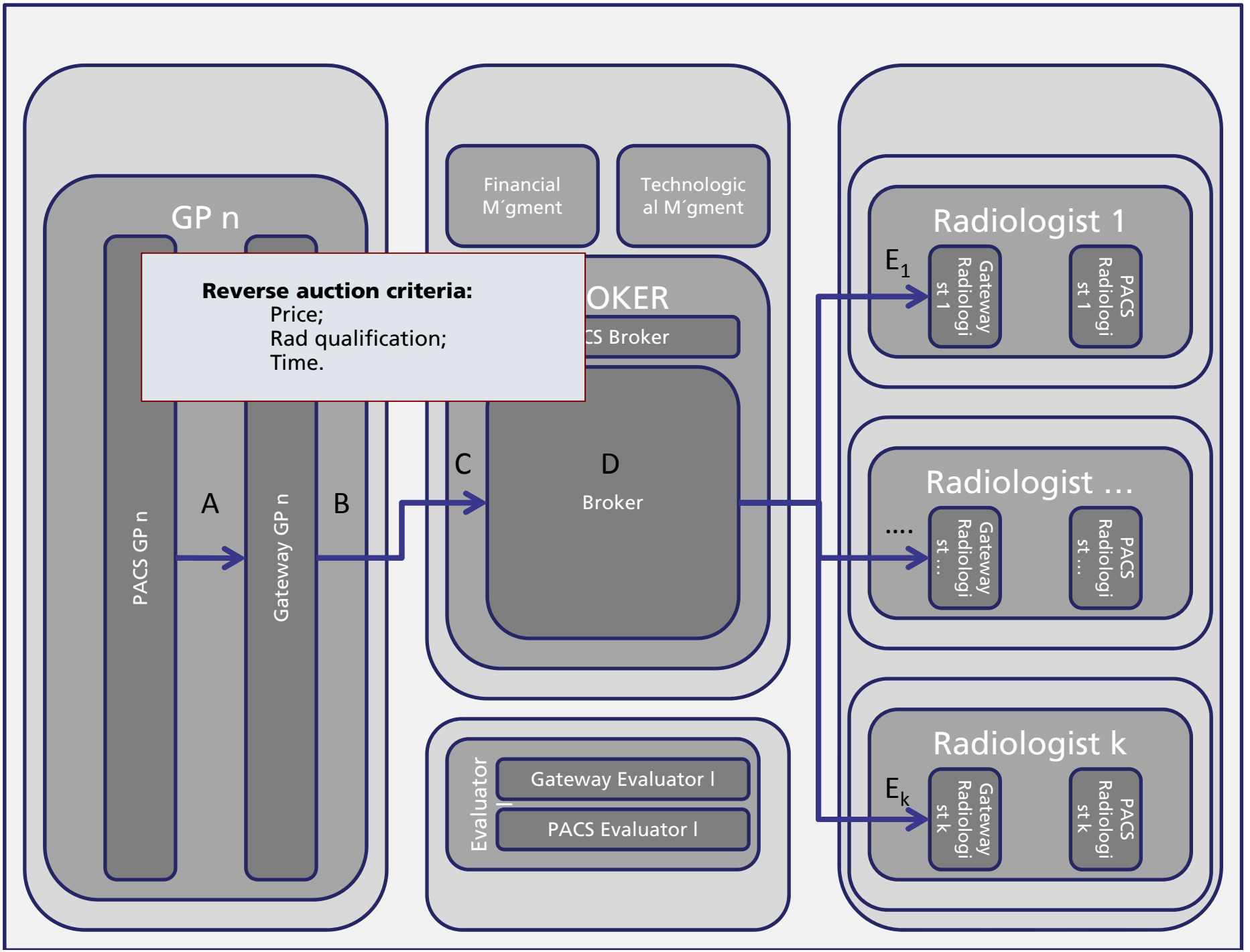
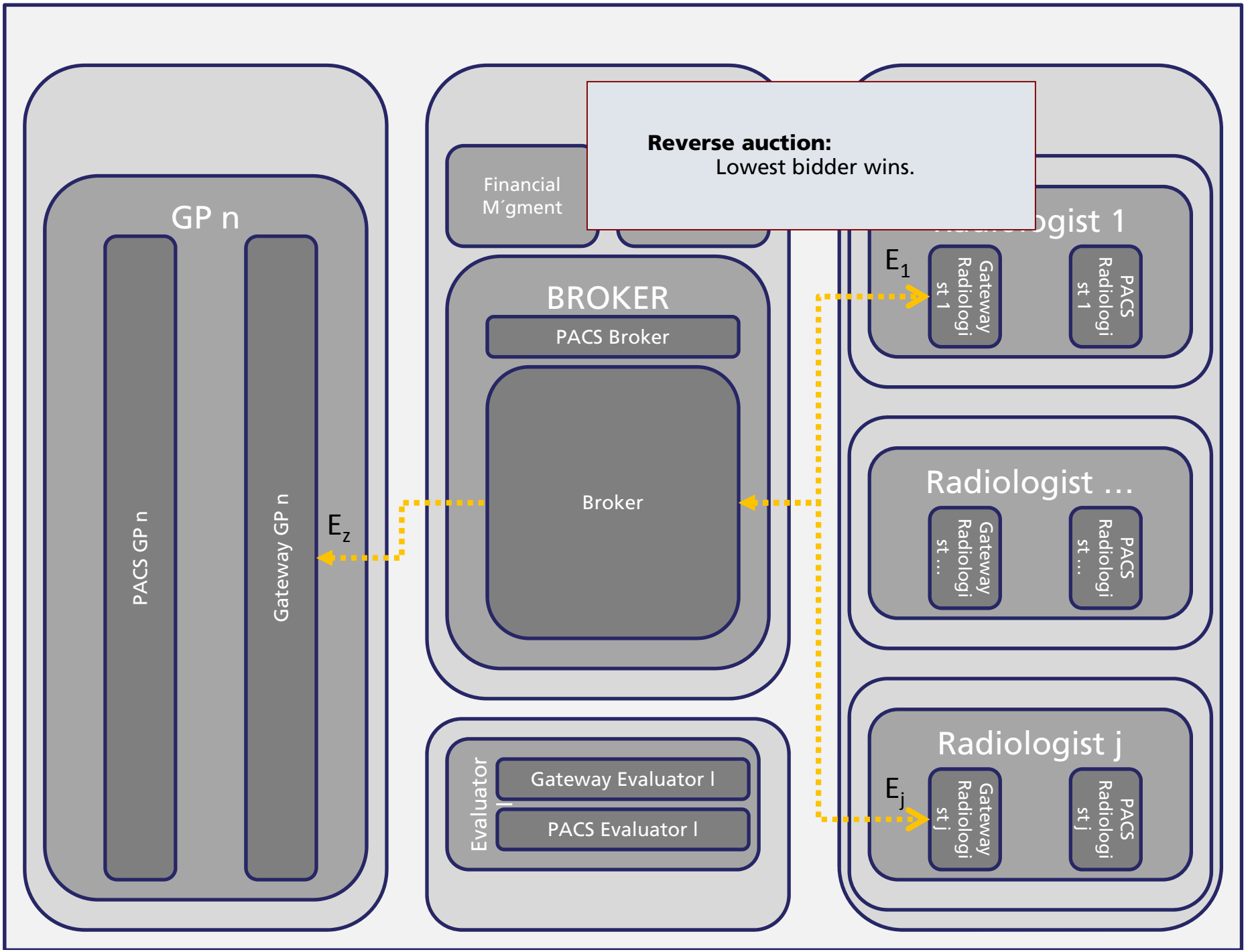
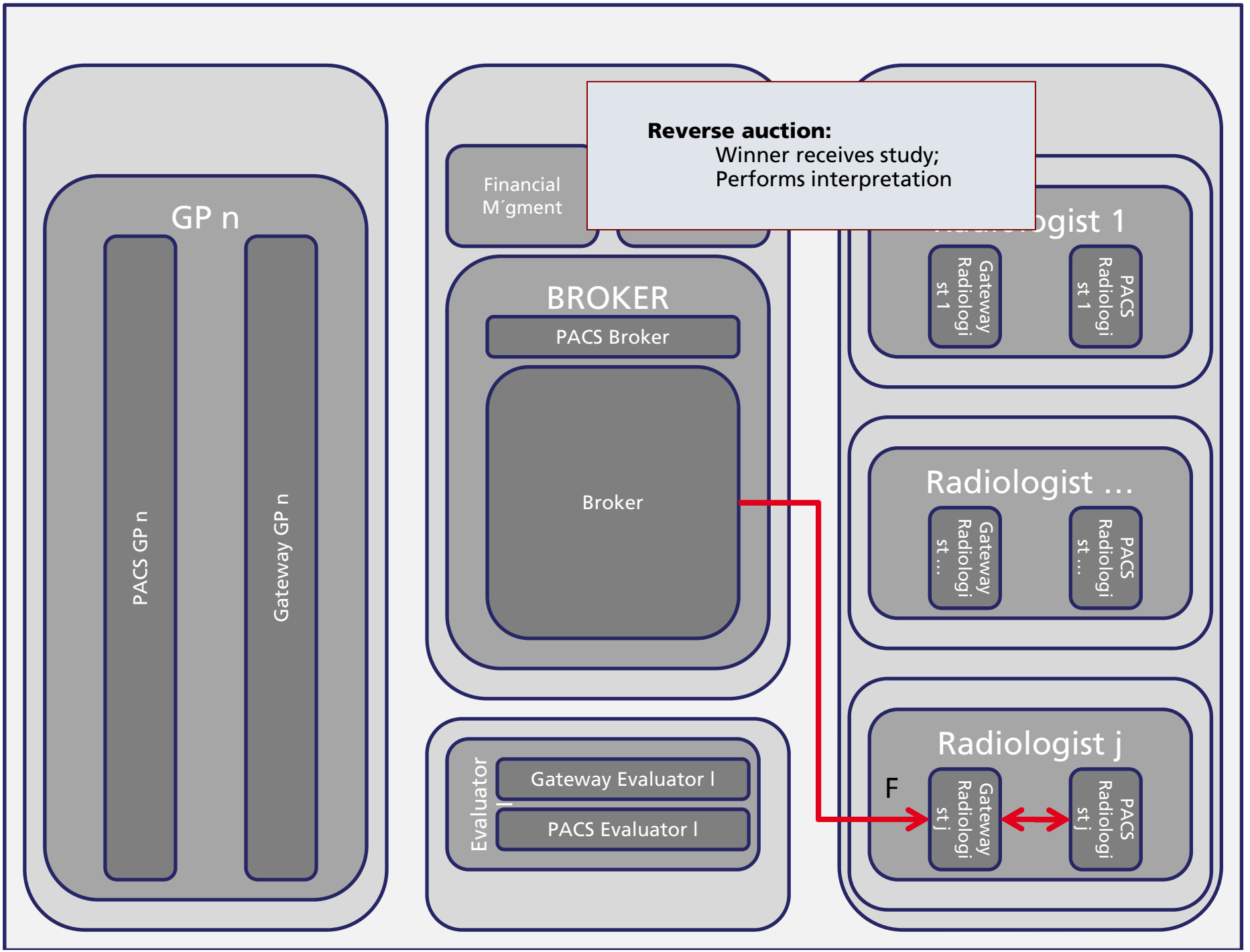
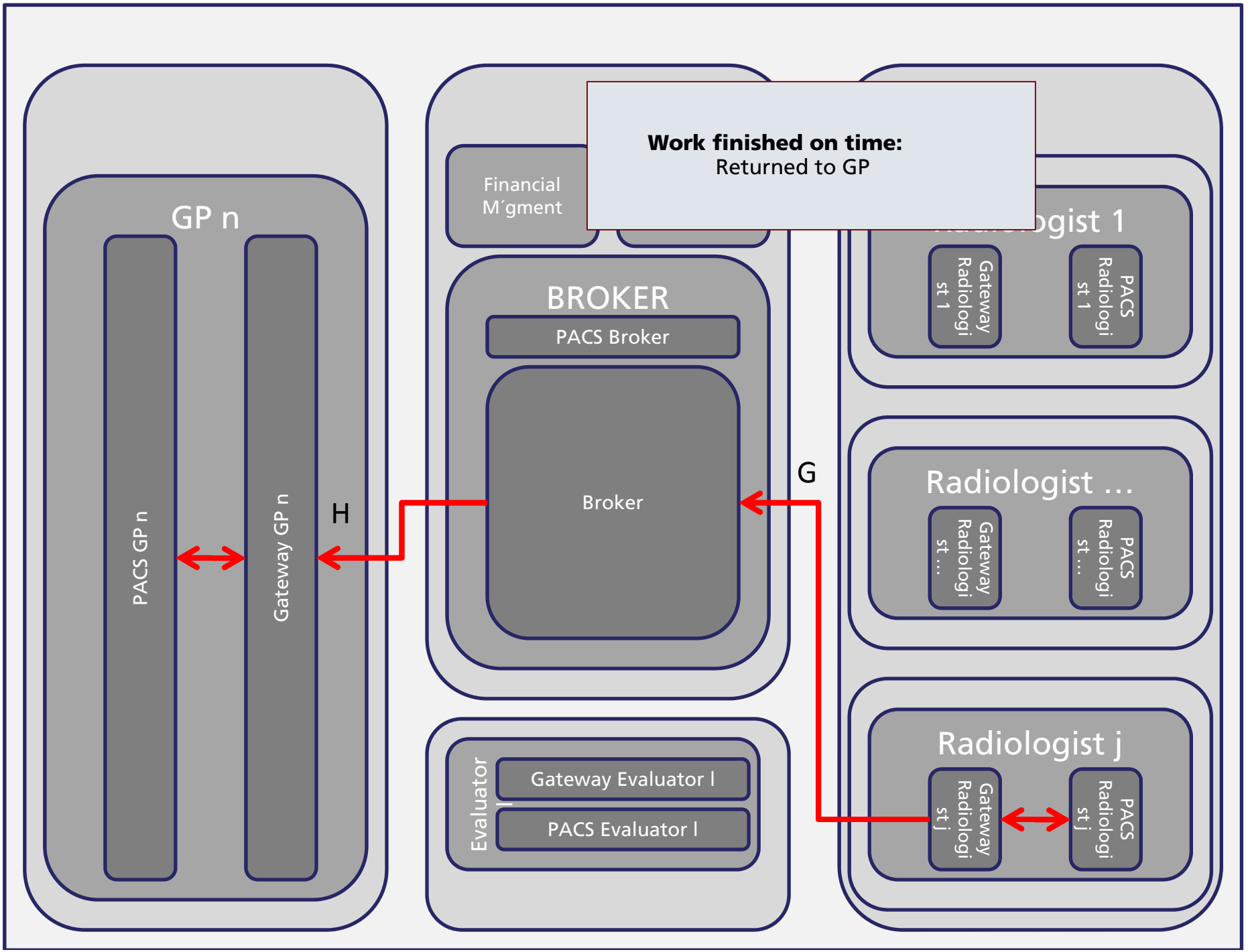
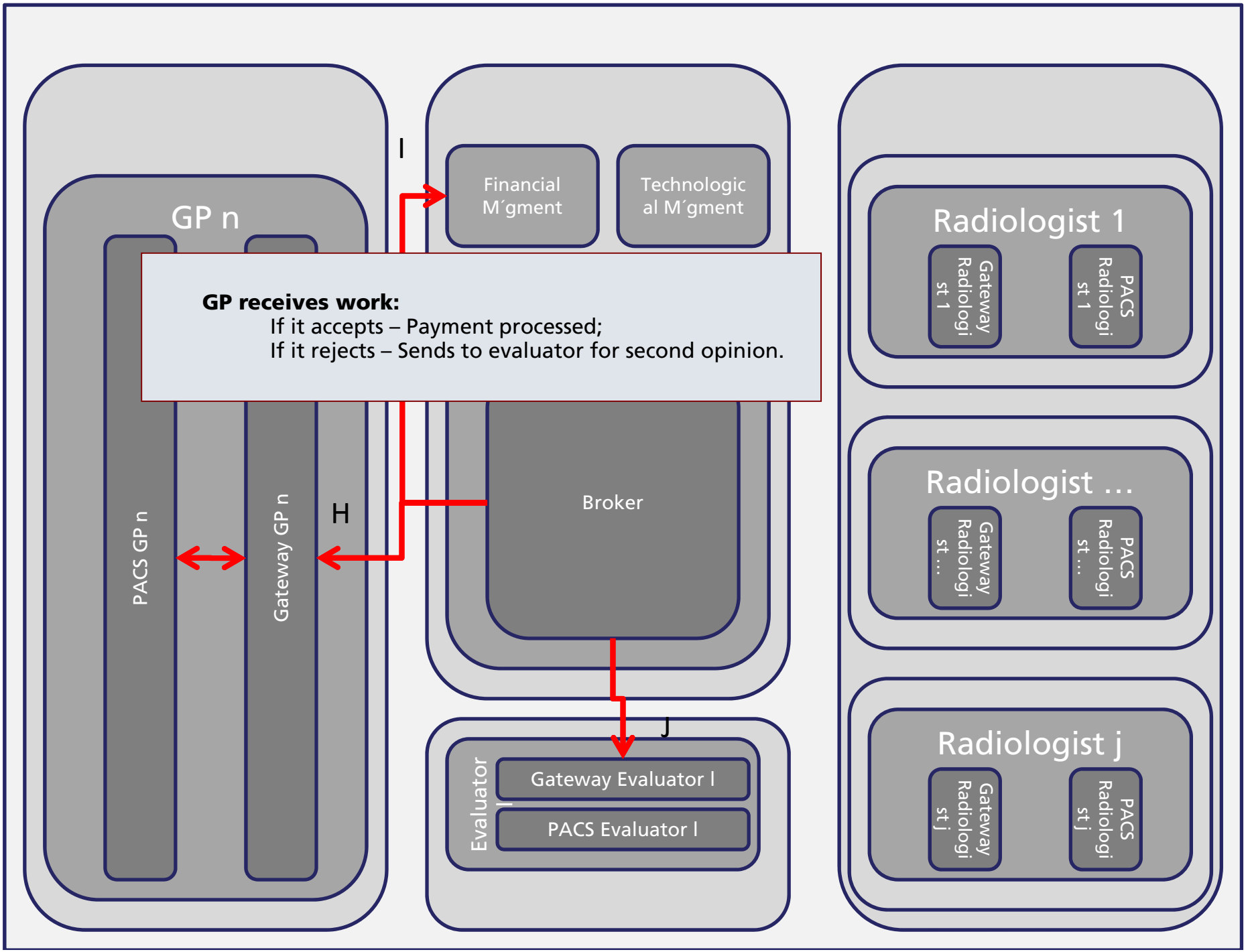

GP n
PACS GP n
Gateway GP n
Financial M´gment
Technologic al M´gment
BROKER
PACS Broker
Broker
Evaluator l
Gateway Evaluator l
PACS Evaluator l
Radiologist 1
Gateway Radiologi st 1
PACS Radiologi st 1
Radiologist …
Gateway Radiologi st …
PACS Radiologi st …
Radiologist k
Gateway Radiologi st k
PACS Radiologi st k


GP n
PACS GP n
A
Gateway GP n
B
Reverse auction criteria:
Price;
Rad qualification;
Time.
Financial M´gment
Technologic al M´gment
OKER
S Broker
C
D
Broker
Evaluator l
Gateway Evaluator l
PACS Evaluator l
Radiologist 1
E1
Gateway Radiologi st 1
PACS Radiologi st 1
Radiologist …
....
Gateway Radiologi st …
PACS Radiologi st …
Radiologist k
Ek
Gateway Radiologi st k
PACS Radiologi st k


GP n
PACS GP n
Gateway GP n
E_z
Financial M´gment
BROKER
PACS Broker
Broker
Evaluator l
Gateway Evaluator l
PACS Evaluator l
Reverse auction:
Lowest bidder wins.
E_1
Gateway Radiologist 1
PACS Radiologist 1
Radiologist …
Gateway Radiologist …
PACS Radiologist …
Radiologist j
E_j
Gateway Radiologist j
PACS Radiologist j


GP n
PACS GP n
Gateway GP n
Financial M´gment
Reverse auction:
Winner receives study;
Performs interpretation
BROKER
PACS Broker
Broker
Evaluator l
Gateway Evaluator l
PACS Evaluator l
Gateway Radiologist 1
PACS Radiologist 1
Radiologist …
Gateway Radiologist …
PACS Radiologist …
Radiologist j
F
Gateway Radiologist j
PACS Radiologist j


GP n
PACS GP n
Gateway GP n
H
Financial M´gment
BROKER
PACS Broker
Broker
G
Work finished on time:
Returned to GP
Evaluator l
Gateway Evaluator l
PACS Evaluator l
Gateway Radiologist 1
PACS Radiologist 1
Radiologist …
Gateway Radiologist …
PACS Radiologist …
Radiologist j
Gateway Radiologist j
PACS Radiologist j


GP n
PACS GP n
Gateway GP n
H
I
Financial M´gment
Technologic al M´gment
GP receives work:
If it accepts – Payment processed;
If it rejects – Sends to evaluator for second opinion.
Broker
J
Evaluator l
Gateway Evaluator l
PACS Evaluator l
Radiologist 1
Gateway Radiologist 1
PACS Radiologist 1
Radiologist …
Gateway Radiologist …
PACS Radiologist …
Radiologist j
Gateway Radiologist j
PACS Radiologist j

Main solution to problem

Imaging Marketplace

	Pros	Cons	Balance
Availability	Interconnection between all institutions and all professionals		Positive
Costs	Reduction through bidding Exam dematerialization	Cost to design, implement, operate and maintain the system	Positive
Process Enhancement	Reduce duplicate exams Rational equipment use Speedier interpretation		Positive
Satisfaction	Choose the most suitable radiologist, fitting the exam to the interpreter		Positive (with the possible exception of the radiologists)

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Relevant audience

According to Osterwalder´s canvas business model

The Business Model Canvas

Key Partners	Key Activities	Value Proposition	Customer Relationships	Customer Segments
- Partnerships for communication management - Partnerships for broker data center management - Management of evaluating and appeal teams	- Auction processes - Appeal processes - Evaluation processes	- Access to radiology care - Swifter interpretation of the images - Enhanced patient treatment - Financial self sufficiency of the system - Enhanced productivity - Risk reduction on the acquisition of image interpretation	- Help desk	- Radiologists - General Practitioners - Healthcare financing institutions (public and private)
	Key Resources - Broker platform management - Expert panel - Market regulation entities		**Channels** - Only web based communication channels	

Cost Structure	Revenue Streams
- Software platform available to the users - Hardware/Software platform where data centre is based - Communication infrastructure, interconnecting users and data centre - Back-up and redundant systems	- One time revenues - Recurring revenues - Appeals and penalties for service level agreement unfulfil ent - Classification review of the selling radiologists - Users system integration and technical help desk service

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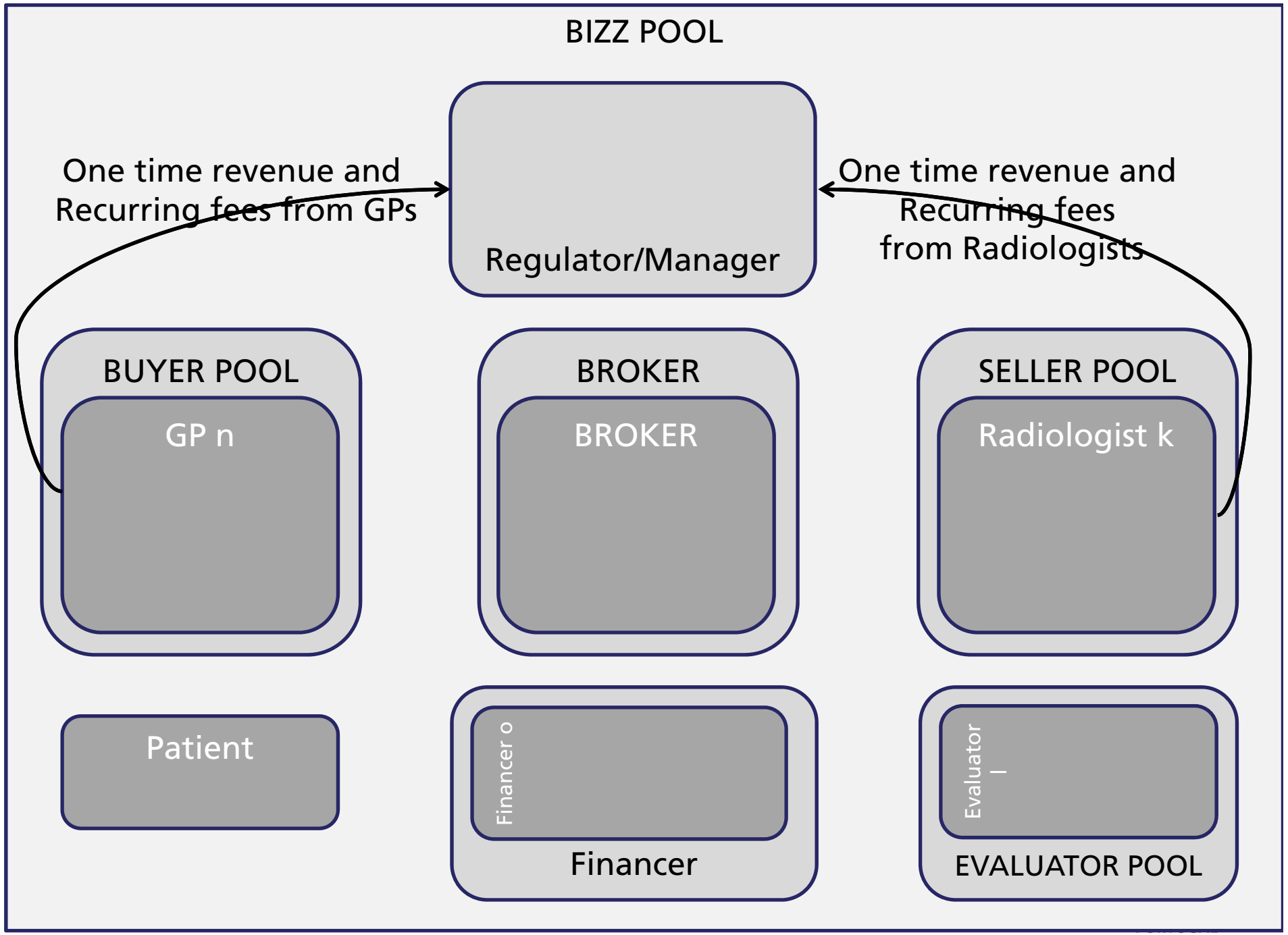
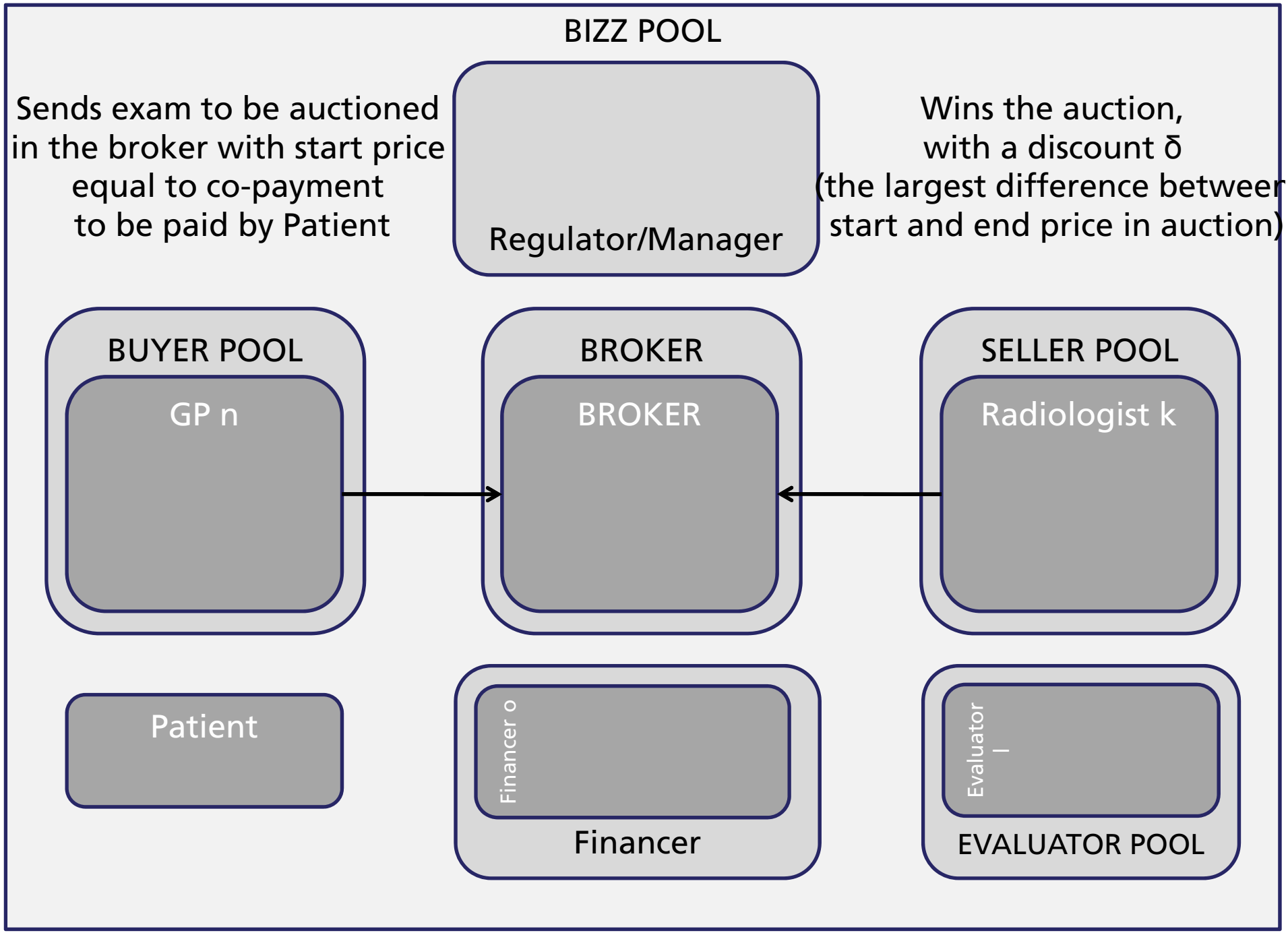
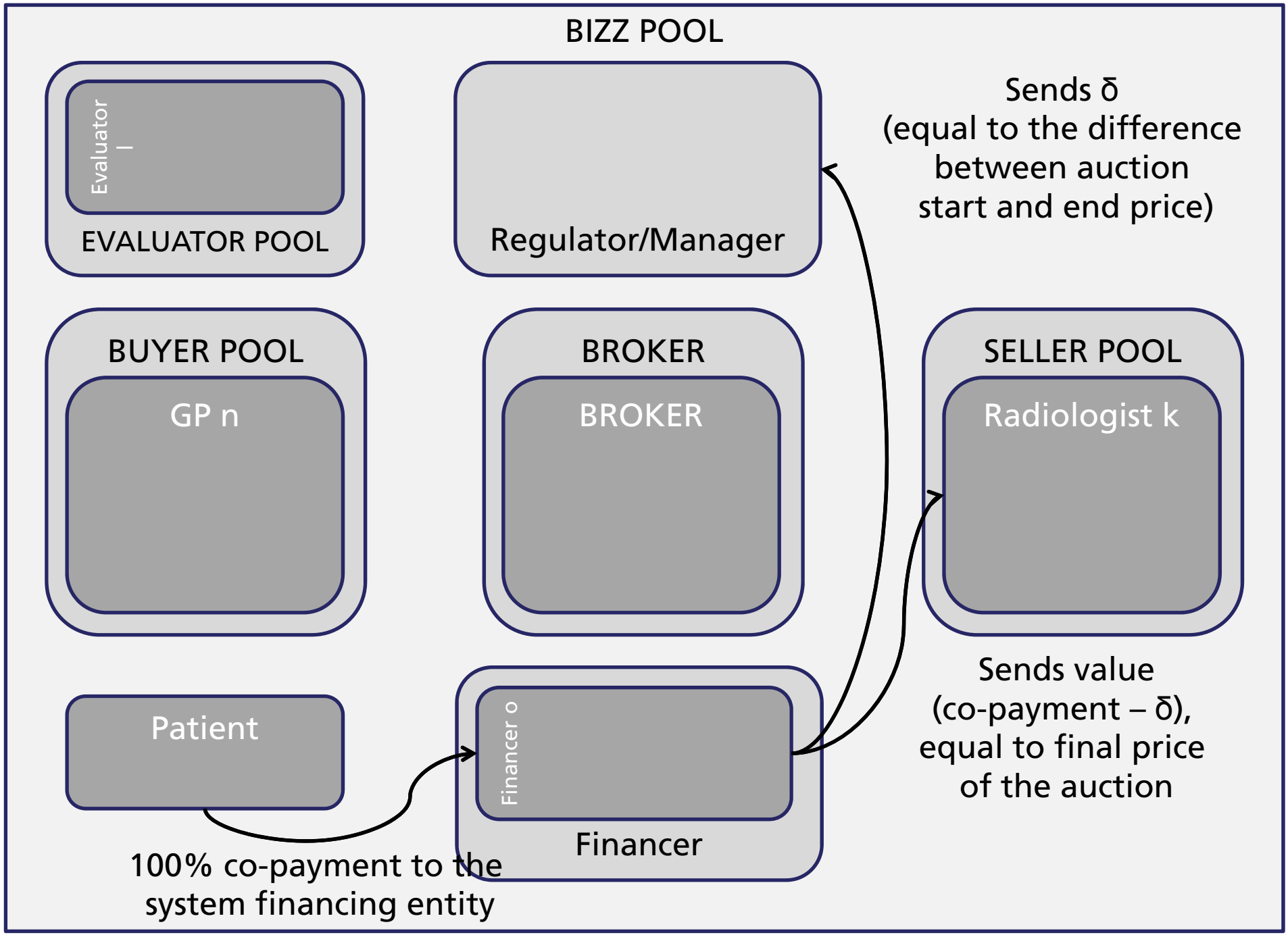
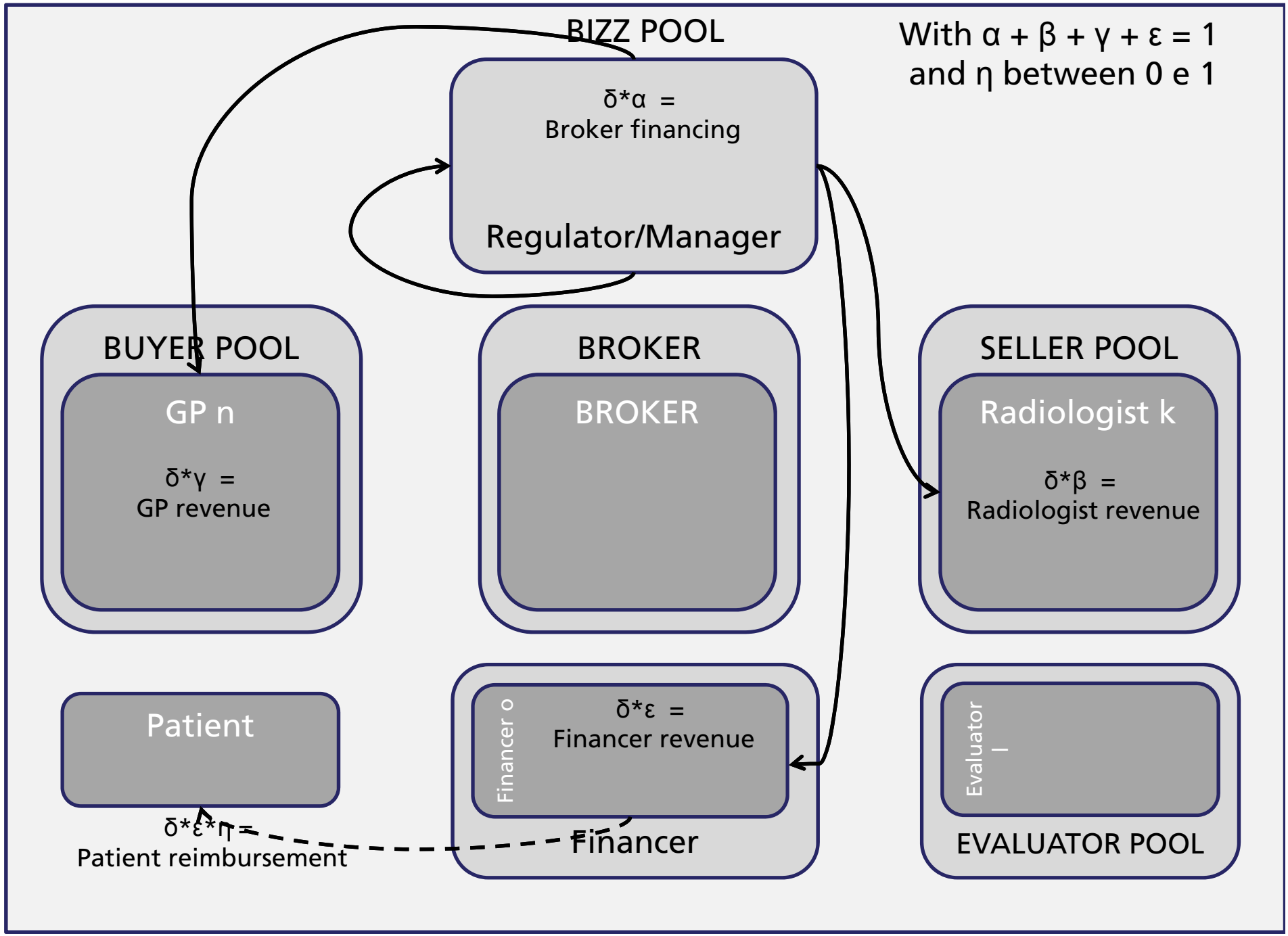

BIZZ POOL
One time revenue and
Recurring fees from GPs
Regulator/Manager
One time revenue and
Recurring fees
from Radiologists
BUYER POOL
GP n
BROKER
BROKER
SELLER POOL
Radiologist k
Patient
Financer o
Financer
Evaluator
l
EVALUATOR POOL


BIZZ POOL
Sends exam to be auctioned in the broker with start price equal to co-payment to be paid by Patient
Regulator/Manager
Wins the auction, with a discount δ (the largest difference between start and end price in auction)
BUYER POOL
GP n
BROKER
BROKER
SELLER POOL
Radiologist k
Patient
Financer o
Financer
Evaluator l
EVALUATOR POOL


BIZZ POOL
Evaluator
l
EVALUATOR POOL
Regulator/Manager
Sends δ
(equal to the difference
between auction
start and end price)
BUYER POOL
GP n
BROKER
BROKER
SELLER POOL
Radiologist k
Patient
Financer o
Financer
Sends value
(co-payment – δ),
equal to final price
of the auction
100% co-payment to the
system financing entity


BIZZ POOL
With α + β + γ + ε = 1
and η between 0 e 1
δ*α =
Broker financing
Regulator/Manager
BUYER POOL
GP n
δ*γ =
GP revenue
BROKER
BROKER
SELLER POOL
Radiologist k
δ*β =
Radiologist revenue
Patient
Financer o
δ*ε =
Financer revenue
Financer
Evaluator
l
EVALUATOR POOL
δ*ε*η =
Patient reimbursement

Value proposition

According to Osterwalder´s canvas business model

- The implementation of the proposed system (currently implemented as a prototype) will:
  - Improve accessibility to radiological services by the population;
  - Improve speed and reduce costs involved in processing the radiological images;
  - Reduce risks involved in the acquisition of imaging interpretation services;
  - Optimize imaging equipment productivity;
  - Enable, through a benefit redistribution among the participants, the financial self-sufficiency of the system.

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Future work

- Improve auctioning mechanism according to the requirements of the end users, namely optimizing the submission process from a “one-by-one” submission to an “en masse” submission process
- Improve system scalability when subject to the use by a large number of customers;
- Create a single user repository at European level, enabling the requirements of the “Cross Border Healthcare” Directive 2011/24;
- Implement the business plan attached to the thesis, managing the marketplace during 5 years.
  - Very conservative approach
  - Expected NPV 141.107€
  - Expected IRR 10,18%

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Backup Slides

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Business plan

		2011				
		Total	SNS	CoPag	%	
Imagiologia						
Angiografia		2011	2012	2013	2014	2015
Ecografia	Percentagem de distribuição por participante (Pessimista)	17,50%	17,50%	17,50%	17,50%	17,50%
Exames radi	Broker	90,00%	90,00%	90,00%	90,00%	90,00%
Mamografia	Financiador	2,50%	2,50%	2,50%	2,50%	2,50%
Ressonância	MCG	2,50%	2,50%	2,50%	2,50%	2,50%
Tomografia	Radiologista	2,50%	2,50%	2,50%	2,50%	2,50%
Outra	Fee MCG participante (Pessimista)	0,00 €	0,00 €	0,00 €	0,00 €	0,00 €
	Fee Radiologista participante (Pessimista)	0,00 €	0,00 €	0,00 €	0,00 €	0,00 €
		2011	2012	2013	2014	2015
	Percentagem de distribuição por participante (Normal)	15,00%	15,00%	15,00%	15,00%	15,00%
	Broker	50,00%	50,00%	50,00%	50,00%	50,00%
	Financiador	20,00%	20,00%	20,00%	20,00%	20,00%
	MCG	10,00%	10,00%	10,00%	10,00%	10,00%
	Radiologista	20,00%	20,00%	20,00%	20,00%	20,00%
	Fee MCG participante (Normal)	10,00 €	10,20 €	10,40 €	10,61 €	10,82 €
	Fee Radiologista participante (Normal)	300,00 €	306,00 €	312,12 €	318,36 €	324,73 €
		2011	2012	2013	2014	2015
	Percentagem de distribuição por participante (Optimista)	12,50%	12,50%	12,50%	12,50%	12,50%
	Broker	30,00%	30,00%	30,00%	30,00%	30,00%
	Financiador	25,00%	25,00%	25,00%	25,00%	25,00%
	MCG	20,00%	20,00%	20,00%	20,00%	20,00%
	Radiologista	25,00%	25,00%	25,00%	25,00%	25,00%
	Fee MCG participante (Optimista)	0,00 €	0,00 €	0,00 €	0,00 €	0,00 €
	Fee Radiologista participante (Optimista)	0,00 €	0,00 €	0,00 €	0,00 €	0,00 €

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Business plan

	2011	2012	2013	2014	2015
População	10.675.295	10.694.652	10.713.734	10.732.130	10.749.837
Médicos	41.426	42.292	43.177	44.079	45.001
Médicos não especializados	15.761	16.212	16.676	17.152	17.643
Especialistas em Radiodiagnóstico	833	844			
			2012	2013	2014
	Exames leiloados (tota		128.629	253.796	785.058	1.499.924	1.841.299
Médicos clinica geral aderentes	Angiografia		540	1.157	3.604	6.697	8.571
Penetração	Ecografia		36.760	72.923	226.696	445.277	551.932
Radiologistas aderentes	Exames radiológicos		60.359	118.940	361.778	674.433	819.026
Penetração	Mamografia		5.329	9.801	28.938	53.422	62.004
	Ressonância magnética		4.499	9.195	29.973	60.817	77.938
	Tomografia axial computorizada (		16.260	32.513	103.189	203.422	254.346
	Outra		4.883	9.268	28.686	55.856	67.482
	Exames leiloados (Publico)		71.871	135.506	418.606	814.988	979.153
	Angiografia		122	222	660	1.236	1.428
	Ecografia		17.169	32.532	100.945	197.292	237.812
	Exames radiológicos		36.831	68.143	206.459	393.998	463.718
	Mamografia		2.172	4.093	12.632	24.554	29.436
	Ressonância magnética		2.726	5.455	17.876	36.897	46.970
	Tomografia axial computorizada (		11.811	22.968	73.142	146.709	181.487
	Outra		1.040	2.093	6.893	14.303	18.303
	Penetração Internamento/Urgência		0,00%	0,00%	0,00%	0,00%	0,00%
	Penetração Externo/Consulta Extern		2,32%	4,18%	12,36%	22,98%	26,37%
	Exames leiloados (Privado)		56.758	118.290	366.451	684.936	862.146
	Angiografia		418	935	2.944	5.461	7.144
	Ecografia		19.592	40.391	127.945	247.985	314.120
	Exames radiológicos		23.527	50.796	155.319	280.436	355.308
	Mamografia		3.157	5.707	16.306	28.868	32.568
	Ressonância magnética		1.773	3.740	12.097	23.920	30.969
	Tomografia axial computorizada (		4.449	9.545	30.047	56.714	72.859
	Outra		3.843	7.176	21.792	41.553	49.178
	Penetração Internamento/Urgência		2,32%	4,18%	12,36%	22,98%	26,37%
	Penetração Externo/Consulta Extern		2,32%	4,18%	12,36%	22,98%	26,37%

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Business plan

Pessimista	2011	2012	2013	2014	2015
Receitas Broker	30.174 €	56.520 €	168.890 €	330.831 €	419.186 €
Custos Broker versão AWS	243.868 €	121.175 €	143.100 €	253.916 €	217.654 €
Custos Broker versão Co-Location	278.091 €	152.275 €	162.372 €	291.030 €	246.700 €

	0	1	2	3	4	5
Vendas		81.302	154.335	472.337	928.009	1.165.590
Volume de Negócios		**81.302**	**154.335**	**472.337**	**928.009**	**1.165.590**
Margem Bruta de Contribuição		**81.302**	**154.335**	**472.337**	**928.009**	**1.165.590**
FSE- Custos Fixos	216.000	132.459	179.491	362.603	444.103	425.876
Resultado Económico	**-216.000**	**-51.158**	**-25.157**	**109.735**	**483.906**	**739.713**
Custos com o Pessoal	34.230	39.557	40.743	59.955	61.214	62.510
EBITDA	**-250.230**	**-90.714**	**-65.900**	**49.780**	**422.692**	**677.203**
Amortizações			464	2.322	6.038	10.683
Provisões						
EBIT	**-250.230**	**-90.714**	**-66.365**	**47.458**	**416.654**	**666.520**
Custos Financeiros	12.644	18.566	23.213	22.593	3.442	142
Proveitos Financeiros						4.060
RESULTADO FINANCEIRO	**-12.644**	**-18.566**	**-23.213**	**-22.593**	**-3.442**	**3.918**
RAI	**-262.874**	**-109.280**	**-89.577**	**24.865**	**413.212**	**670.438**
Impostos sobre os lucros						
RESULTADO LÍQUIDO	**-262.874**	**-109.280**	**-89.577**	**24.865**	**413.212**	**508.742**

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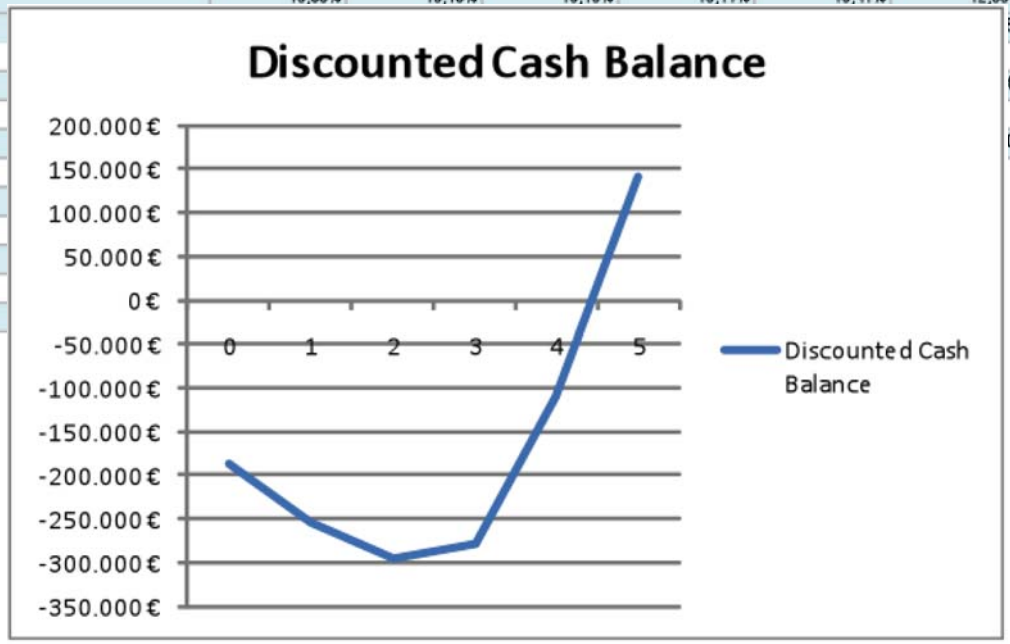
Business plan

Avaliação do Projecto / Empresa

Na perspectiva do Projecto	0	1	2	3	4	5
Free Cash Flow to Firm	-187.683	-75.615	-52.488	23.116	282.289	475.422
WACC	13,00%	13,16%	13,15%	13,11%	15,41%	12,99%
Factor de actualização						38
Fluxos actualizados						49
Discounted Cash Balance						07
Valor Actual Líquido (VAL)						
Taxa Interna de Rentibilidade						
Pay Back period						



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