



Company Productivity as a Cost Driver

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EUROPEAN SPACE AGENCY

About the author

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2008-today @ ESA (Cost Engineering, Project Control, Industrial Audit)

2002-2006 @ Industry (System Engineering, Cost Engineering)

2001-2002 @ ESA, Graduate Trainee

2000-2001 @ Industry (PA/QA, Production Management Support, Cost Analysis)

2000 Master degree in Aerospace Engineering, Space Systems Design, University of Pisa (IT)

Certified Parametric Practitioner (ISPA 2007), member of AICE (IT), member of ESA IPC Expert Group

ESA Industrial Audit Services Office

D/CFO - Directorate of Controlling, Finance and Operational contracting

CFO-I - Industrial Policy and Auditing Department

CFO-IA - Industrial Audit Services Office

Head of the Industrial Audit Services Office
Ms Karina Miranda Sanchez

Head of the Industrial Audit Baseline Services
Mr Paolo Ponzio

Head of the Industrial Audit Support Services
Mr David Garcia Vargas

Activities



1. AUDITS

Rates
Contract incurred costs
Contract price pre-award
Nationality
Financial Viability and Monitoring
Programme Specific
Manpower framework contracts



2. ADVICE

Tender/Panel evaluation boards
Programme and contract
preparation/negotiations
Price Variation Formula, Indexes



3. COLLABORATION

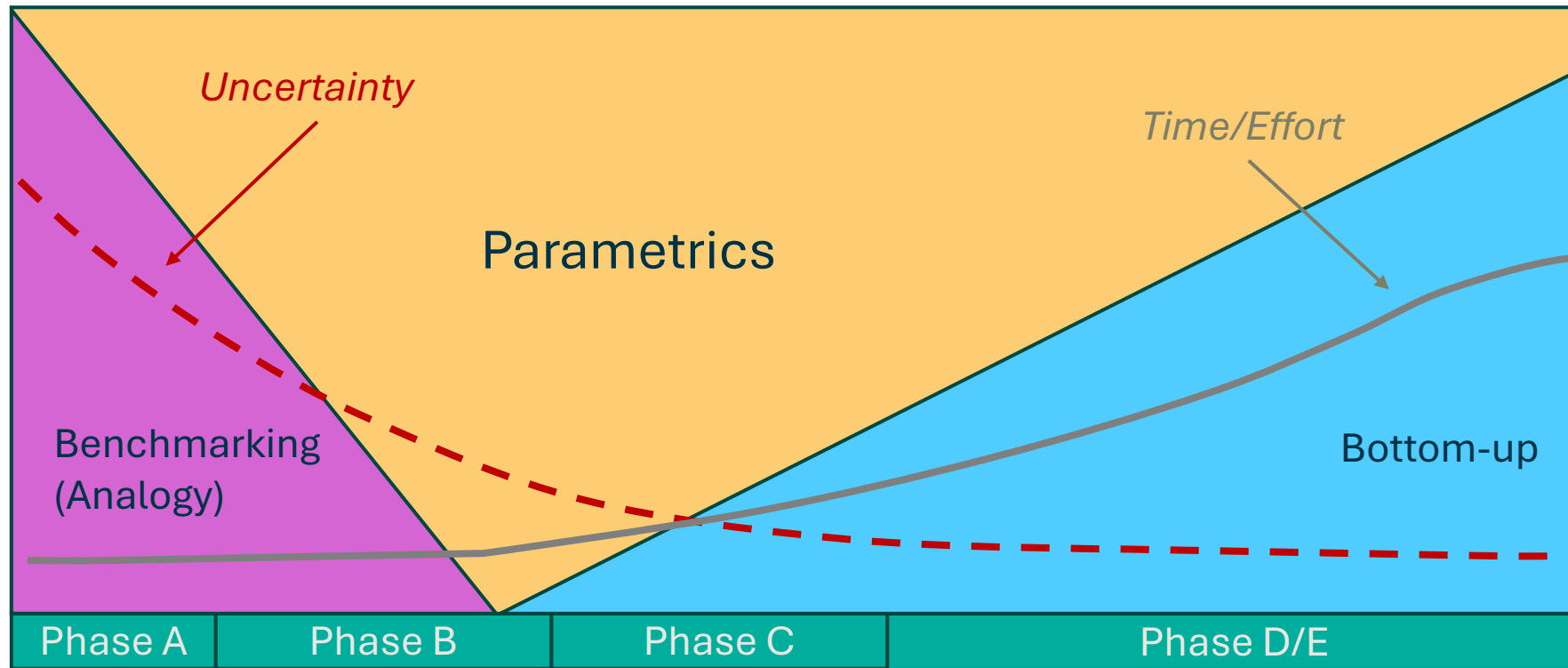
National Audit Authorities
IPC Expert Group
Special agreements with: FR
(DGA/CNES), IT (ASI), DE
(DLR/PÜ), BE (MoD), CA (PSPC)
Industry (ESA-Industry Forum,
LSI, MidCap and SME forums)



4. REGULATORY & WORKING FRAMEWORK

Review and evolution of
cost/audit policies and
regulations
Training and tools
ESA Price Breakdown Forms

Cost Engineering methods



Cost bundles

Benchmarking:

System total

Parametric:

System/subsystem/
equipment total

(sometimes more elementary
for critical product breakdowns)

Bottom-up:

Labour + Direct Cost at
WP level (WBS, schedule)

Smallest unit of cost adopted: hourly rates

Benchmarking: possibly (~never)

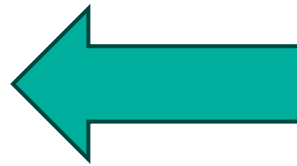
Parametric: often

Bottom-up: always

Cost Rates

Labour hourly rates
Special Facilities cost rates
Procurement overheads

Cost/Profit Centres
Cost Allocation Plan
G&A
R&D
...



The rates of any organisation
are linked to the
“Company Productivity”



The concept of 'Company Productivity' at ESA is defined as:

“The ratio of sellable hours and worked hours of all personnel, including external workforce and allocated group centralised functions, in consideration of a normal business level.”

(ref. ESA/REG/002 Annex I Section 3)

This ratio is a key parameter calculated by the ESA Industrial Cost Auditors for the analysis of reasonability and allowability of Cost hourly rates. In most of the cases it represents a primary cost driver in the calculation of the hourly rates.

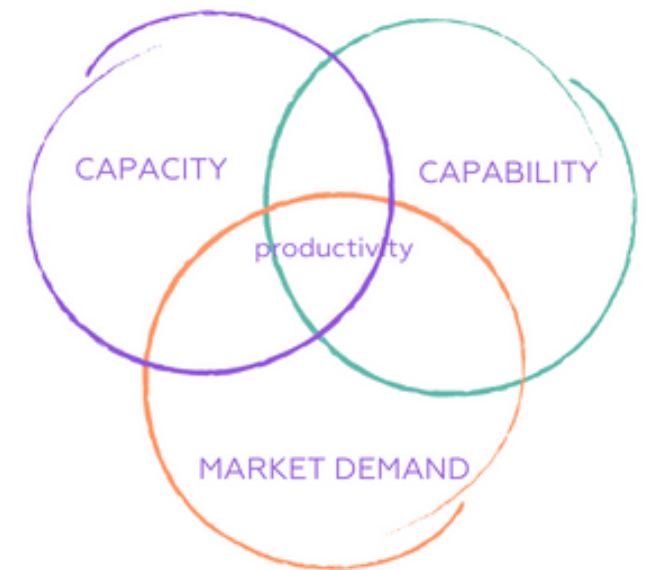
Other terminology

Direct workforce is the personnel allowed to charge hours to sales and productive projects (R&D, Internal)

Utilization is the ratio of sellable / worked hours of the Direct workforce

Sellable hours are the portion of worked hours that can be charged to sales and R&D projects
= Productive hours

Capacity = total Productive hours



Company Productivity Examples



Total workforce	125						
Average worked hours	1700	(Availability)					
	Case 1			Case 2			Case 3
D/I workforce	4.0			3.0			3.5
Utilization	90.0%			65%			85%
	Sellable hours	Worked hours		Sellable hours	Worked hours		Sellable hours
Direct Workforce	153,000	170,000		103,594	159,375		140,486
Indirect Workforce	0	42,500		0	53,125		0
Total	153,000	212,500		103,594	212,500		140,486
Company Productivity	72.0%			48.8%			66.1%
Average Productive hours	1530			1105			1445
Hours covered by							
1 sold hour	1.4			2.1			1.5

Several parameters: Availability, Utilization, Company Productivity, Capacity are the main ones.



Standard and productive hours



Standard Hours per FTE		Days
Workable	2000	250.0
Annual leaves	-200	-25.0
Absences	-100	-12.5
Availability	1,700	212.5

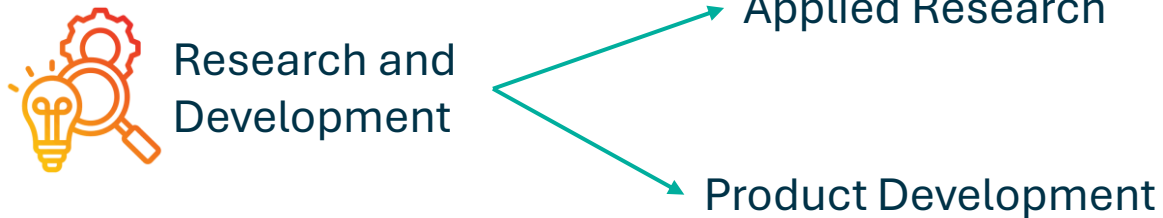
Sales	1275	75%	includes any funded and partially funded contracts
R&D	170	10%	includes 100% self-funded R&D activities
P&T	85	5%	"Proposals & Tenders" (before contract award)
Internal tasks	85	5%	E.g. improvement processes, maintenance, other
Non-productive	85	5%	Training, Admin, HR, H&S, Unions, Gen. meetings
	1,700		
Average Productive hours	1,445		Utilization = 1445/1700 = 0.85

} PRODUCTIVE HOURS

Changes in ESA regulations and methodology:

- 1. In 2024 Council approved activities related to SPACE Product Development to be eligible for ESA R&D overhead
- 2. From 2026 ESA audited rates adopt all R&D hours as productive/sellable (previously only Product Development)

R&D activities and allowable overhead in ESA contracts



Activities targeted to improve or solve specific issues, incl. performances, faults, non-compliances of products and services.

Applied Research activities targeted to specific products or family of products. And any technology improvement above TRL5.

ESA provides direct funding for R&D activities through many programmes (TDE, GSTP, ARTES, FLPP, PRODEX ...) and also the initial development in many commercial programmes (Ariane, Copernicus, ...).

In addition to that funding, ESA Member States accepted to contribute to the companies self-funded R&D within the cost rates (overhead) applicable to ESA contracts, with a maximum limitation of 7.5% of the applicable Cost Base.

For any type of R&D activity, ESA recognise the effort (hours) as productive and sellable.

An R&D overhead cost is added to the G&A expenses and integrated in the gross rates.

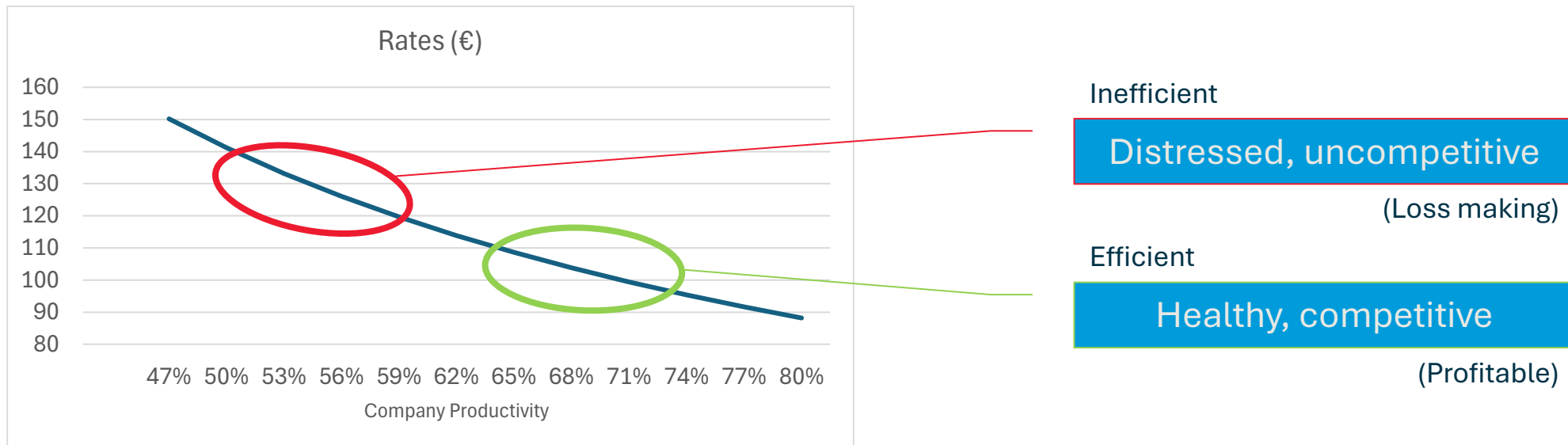
ESA Industrial Audit experience with Company Productivity

- Higher Productivity → Better Cost Control
- Healthy/Successful companies have higher Productivity
- Productivity is often linked to proper implementation internal processes (timesheet system, cost control)
- Productivity is affected by company culture (lean management, productivity targets ...) and good organisation of work/tasks
- Productivity is affected by the sales level and orders backlog
 - Secondary impact on Availability and Utilization

In ESA Rates Audits, the Company Productivity is a metric for the *reasonability* of the rates calculation.

Correlation of Company Productivity with cost rates

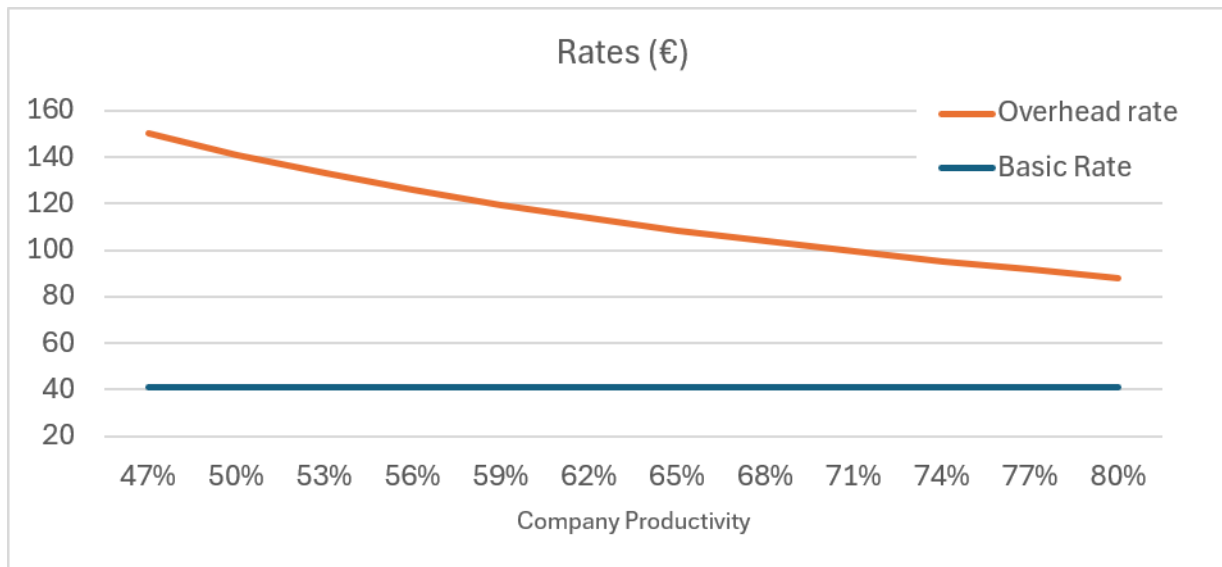
In the ESA Industrial Audit experience, there is often a large opportunity for improvements in terms of Company Productivity; these improvements make a big difference between a competitive and non-competitive industry.



The value of the rates is strongly correlated to the Company Productivity.

Company overheads

Same chart, giving evidence of the overhead rates, highlights the importance of the company productivity.

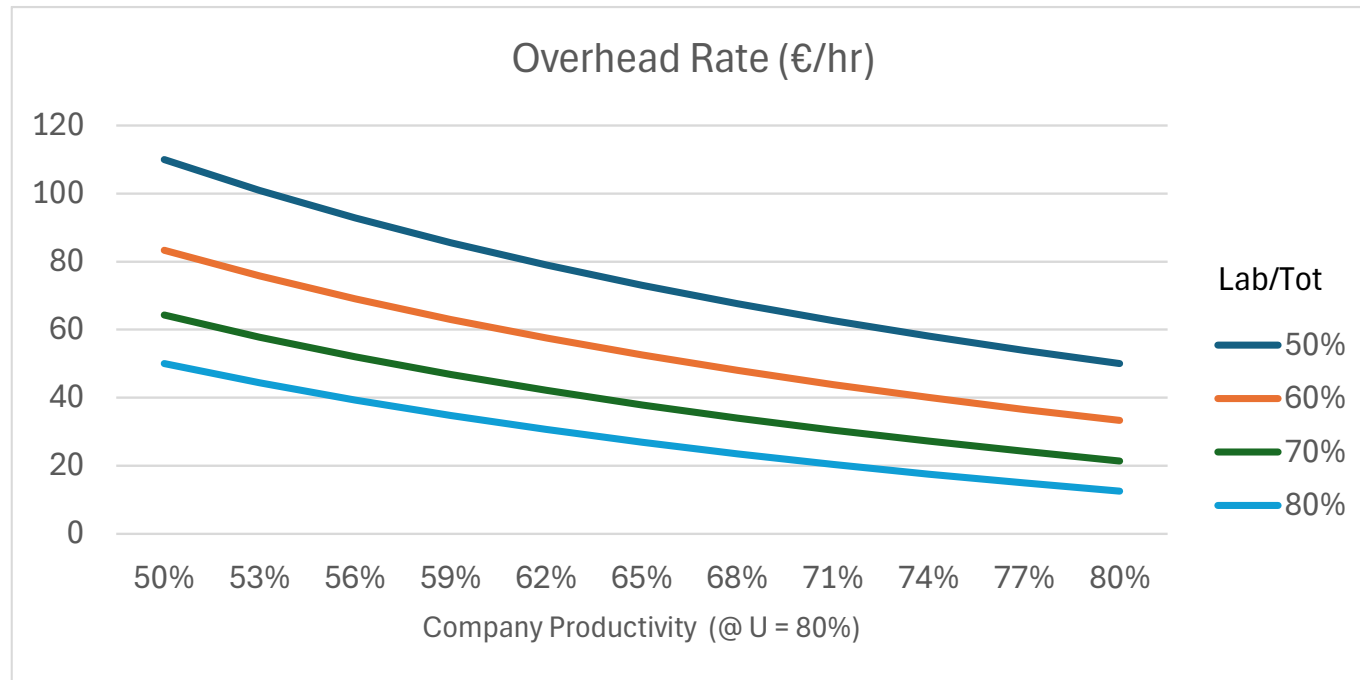


Basic Rates (or Direct Rates) include only the “Cost of Labour” (salaries, social charges, pension) → does not depend on the Productivity : *the cost of a worked hour does not depend on the final use.*

Overhead Rates include the “Indirect costs” (indirect personnel, accommodation, internal services, etc.) → depend on the Company Productivity.

*The company indirect costs are typically **fixed or semi-fixed** and are charged as a ‘markup’ (over-head) to each sold hour. The higher is the Capacity (total sold hours), the lower is the unitary allocation.*

Company productivity reduces the overhead rate



The Productivity impacts are not linear and **depend on many factors.**

The graph shows that

1. The impact is higher when the Labour cost is the main portion of the Total Cost. [read the note below]
2. The impact is higher at lower values of the productivity: changes around 50% produce a bigger impact than at 80%.

The second point is particularly interesting because it means that when the Productivity is low, even small improvements can be very beneficial.

Note: the visual effect may be deceiving; the drop of the 80% line is -75%, while the drop of the 50% line is 54.5%.

Why Productivity and Overheads in Cost Estimating?

The typical case of space projects, especially with R&D at ESA, has a cost that is largely driven by manpower ... engineering and MAIT hours.

- At any level of the contractual chain, from Prime to suppliers.
- For large and especially for small organisations.

70-80% of Industrial Cost at ESA is calculated by

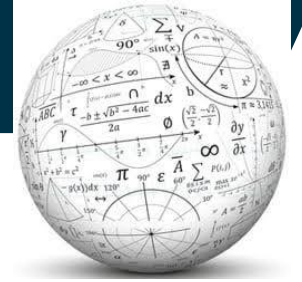
C = Number of person-hours x Hourly rate

and

Hourly rate = Basic Rate + Overhead Rate
(similarly for Basic Rate x Overhead %)

where, Overhead Rate is
f(Productivity)

Productivity as a variable of cost estimates



$$C=f(P)$$

$$C = \text{Hours} \times (\text{BR} + \text{OR})$$

- BR = Basic Rate (Labour cost only)
- OR = Total Company Overheads (€) / Total Company Productive Hours (hr)

Also

$$\text{OR} = \text{Total Overheads (€)} / (\text{Total Company Worked Hours} \times \text{Productivity})$$

ESA Rates Agreements include BR and Gross Rates (BR+OR) as separate values.

In case of multiple hourly rates, for sensitivity analysis, you can use the average basic and overhead rates, averages weighted using the charged hours.

Examples of productivity analysis on project cost



Overhead Rate = (of gross rate)	50%			50%			65%	
Project Price	5,000,000			5,000,000			5,000,000	
Labour	3,500,000	70%		4,250,000	85%		4,250,000	85%
ODC	1,050,000	21%		300,000	6%		300,000	6%
Profit	450,000	9%		450,000	9%		450,000	9%
Productivity improvement								
1%	4,940,614	-1.2%		4,936,567	-1.3%		4,929,687	-1.4%
2%	4,922,098	-1.6%		4,914,083	-1.7%		4,900,458	-2.0%
3%	4,903,942	-1.9%		4,892,036	-2.2%		4,871,797	-2.6%
4%	4,886,135	-2.3%		4,870,413	-2.6%		4,843,688	-3.1%
5%	4,868,667	-2.6%		4,849,202	-3.0%		4,816,113	-3.7%

Productivity Improvements enable price reductions or more work/**profit** within the same price.

- Time management/recording is mandatory for ESA contracts.
- Experiences show often a large 'dispersion' of hours. The Direct Personnel should be forced to charge hours only to a limited and controlled number of Tasks, validated by the Task manager.

2. Recognise properly the non-Sales activities
 - Auditors observe often a lack of attention on non-Sales charges, especially when personnel have freedom to declare non-productive time.
 - Recognition of R&D and internal improvement projects hours.
3. Clear identification of direct and indirect personnel.
4. Produce guidelines on timesheet compilation and request timely submissions.
5. Recognise actual hours, not only standard time.

What is ESA doing to improve recognition of Productivity

- Any R&D activity is recognised as Productive (sellable)
 - In the past hours dedicated to self-funded R&T (TRL<5) were considered non-productive.
 - ESA regulation change (2024) : self-funded Product Development activities for Space technologies accepted for ESA contribution.
- Auditor deep review of cost centers' Utilization
 - Improves the Utilization levels (sellable hours) with no impact on rates.
- Training and awareness, especially for SME
 - Explain the correct time management and hours allocations.

Higher sellable
hours !





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THANK YOU!

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