Industrial Experience

Assessing the capability of non-software processes using ISO/IEC 15504

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The organizations involved

- **Snam Rete Gas**
  - the customer
- **Det Norske Veritas Italia**
  - the assessment service supplier
- **Tony Coletta (Qual. I.T. Consulting)**
  - the competent assessor

The need

- Snam Rete Gas manages the gas transportation network in Italy
- Monopoly monitored by National Authority
- Needs to demonstrate the quality of its network management processes to stakeholders (internal management, gas shippers, National Authority)
- Looking for a formal third party qualification/certification schema for its processes

The idea

- No specific conformity/rating standard available for the customer's processes (other than ISO 9001 for general QMS)
- ISO/IEC 15504 process capability measurement framework theoretically applicable to any process
- Let's try it !
- Do we have all the elements necessary to perform a conformant assessment ?

Documents from the standard

- ISO/IEC 15504-1:2004 Concepts and vocabulary
- ISO/IEC 15504-2:2003 Performing an assessment
- ISO/IEC 15504-3:2004 Guidance on performing an assessment
- ISO/IEC CD 15504-5 (SC7 N2887) An exemplar Process Assessment Model

Elements of the assessment process

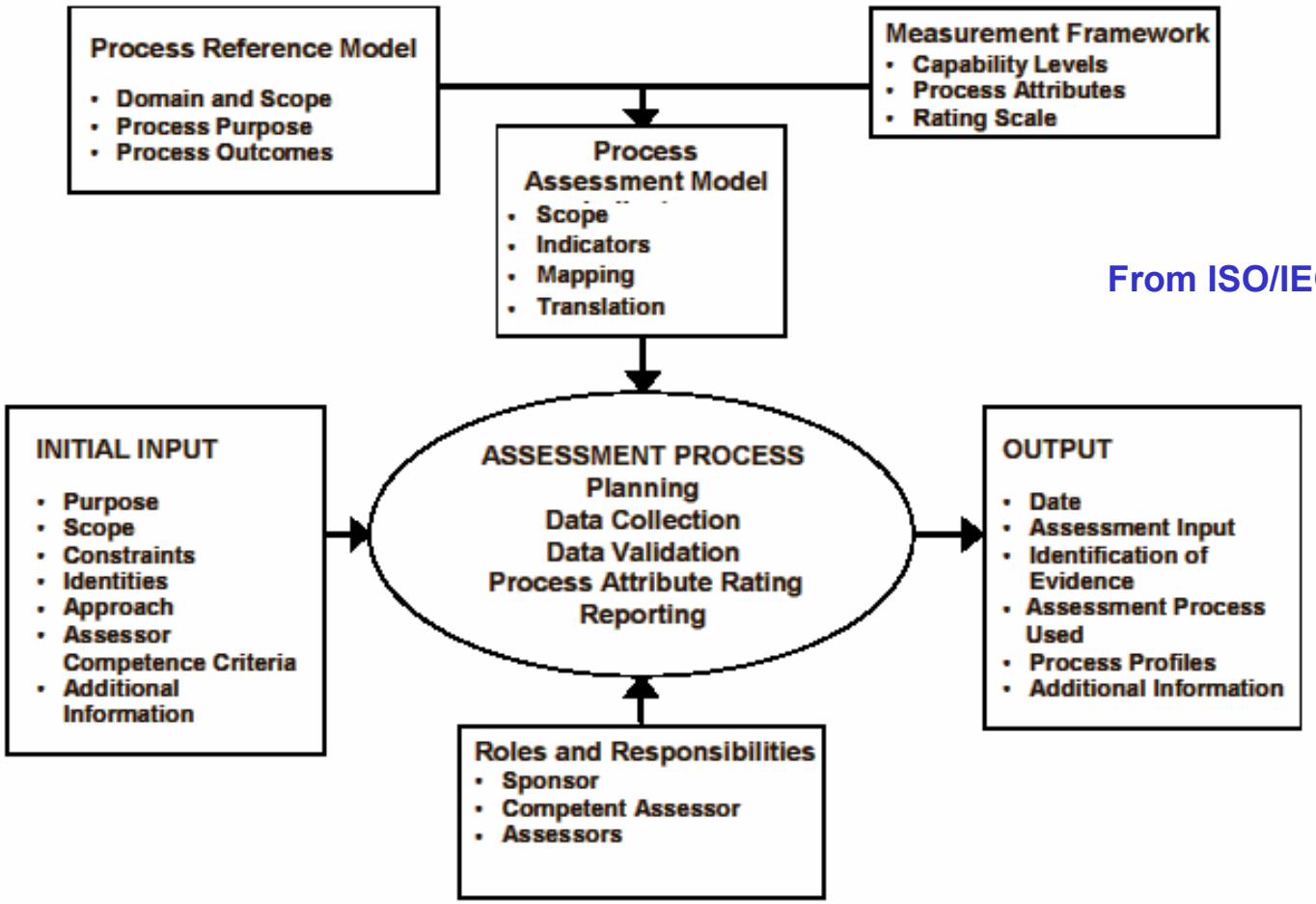


Figure 4 — Major elements of the assessment process

Roles and Responsibilities

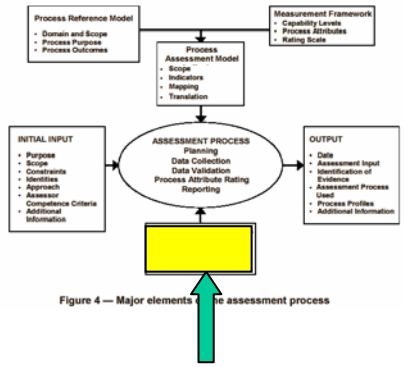


Figure 4 — Major elements of the assessment process

- Sponsor
  - Snam Rete Gas top management
- Competent Assessor
  - Tony Coletta – certified by iNTACS as Principal Assessor
- Assessment Team
  - Personnel from Quality department (2)
  - Personnel from OU deploying the process (2)

The Assessment Process

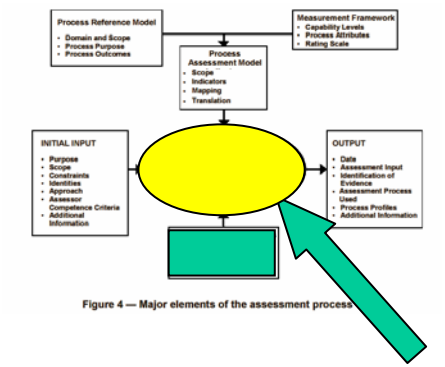


Figure 4 — Major elements of the assessment process

Activities to be performed

- Initiation, Planning, Briefing, Data Collection, Data Validation, Attributes rating, Reporting

↘ Assessment process (source for documented process)

- ISO/IEC 15504-2 clause 4.2 Requirements for the assessment process
- ISO/IEC 15504-3 Annex A – An Exemplar Documented Assessment Process
- DNV accredited documented procedures for conformity assessments (ISO 9001 and others) adapted for the occasion

The measurement framework

Optimising
Quantitative measures used for continuous improvement process

Level 5	Optimising
PA.5.1	Process Innovation
PA.5.2	Process Optimization

Predictable
Metrics make process performance and results controllable

Level 4	Predictable
PA.4.1	Process Measurement
PA.4.2	Process Control

Established
Predefined processes are tailored for specific use, resources are managed.

Level 3	Established
PA.3.1	Process Definition
PA.3.2	Process Deployment

Level 2	Managed
PA.2.1	Performance Management
PA.2.2	Work Product Management

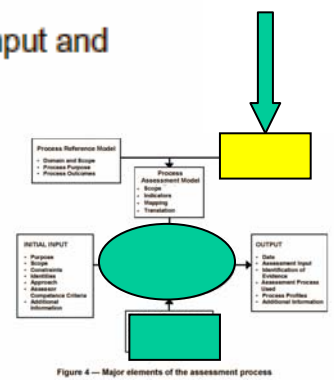
Managed
Process and work products are managed, responsibilities identified.

Level 1	Performed
PA.1.1	Process Performance

Performed
processes are intuitively performed, input and output work products are available

Level 0 Incomplete

Incomplete
Performance and results are incomplete, chaotic processes



The Process Reference Model

- We needed formal definitions for the processes to be assessed
- Could we develop our own PRM ?
- What resources could we use ?
  - Requirements from ISO/IEC 15504-2 (clause 6.2.3)
  - Guidelines for Process Definition (ISO/IEC JTC1 SC7 WG7 N0657)
  - Experience from work in WG7 and WG10

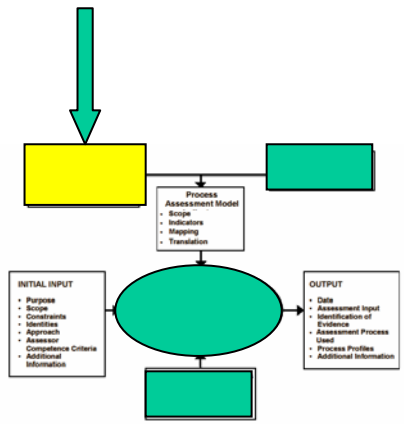


Figure 4 — Major elements of the assessment process

Requirements for Process Descriptions

- Unique Process ID and Title
- Statement of the Purpose
  - Describes at a high level the overall objectives of performing the process
- Outcomes
  - Demonstrate successful achievement of the process purpose
  - Can be :
    - a production of an artifact
    - A significant change of state
    - Meeting of specific constraints, e.g. requirements, goals, etc.

Other PRM requirements

- Domain: Utilities (gas)
- Community of interest – internal to SNAM
- Relationship between processes
  - Initially only 1 process – later one more
  - PRM composed of 2 processes – no direct relationship between them
  - In the future it may grow into a full PRM including all processes from the O.U. assessed

Process Definition (1st assessment)

Process ID	AP.01	Updated on	03-10-02
Process Name	**Calculate *Line-Pack* variations**		
Process Purpose	The purpose of the process **Calculate *Line-Pack* variations** is to monitor the data from the gas transportation network and determine the hourly variation of the Line Pack in order to allow dispatching operators to balance the pressure in the network and provide invoicing information to the commercial operations.		

Process Outcomes

Process Outcomes	As a result of a successful implementation of the process: 1. Data from the SCADA system is processed determining the delta line pack 2. The reliability of the data from the SCADA system (eg. gas pressures) is verified and, if necessary, substituted with data from alternative source 3. The criteria used for the substitution of invalid data are defined thru a configurator 4. Where necessary, operators introduce data manually to sobstitute invalid data 5. Records related to data substituted manually are kept 6. The hourly, daily, monthly and annual delta line-pack is determined, made available to the dispatching operators and archived 7. The dispatching operating room has access to information related to all elements that contribute to the status of the network 8. Information for invoicing is made available to the Commercial Operation

The Process Assessment Model

- We needed indicators for all attributes
- Level 2 to level 5 attribute indicators taken from ISO/IEC 15504-5 (CD) – generic for all processes
- Level 1 attribute indicators specific for the process defined ad-hoc
  - Base Practices
  - Work Products

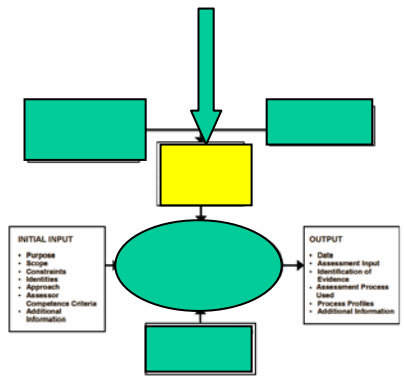


Figure 4 — Major elements of the assessment process

Indicators: Base Practices

Base Practices	APP.01.BP1 : *Prelievo dei dati da SCADA*. Prelevare, ogni ora, dal Database SCADA i dati telerilevati necessari ad effettuare il calcolo del Line-Pack per ogni tratta gestita. [Outcomes: 1] APP.01.BP2 : *Definizione dei dati da prelevare da SCADA*. Definire, attraverso una funzione di configurazione i dati da prelevare dal Database SCADA. Definire ove applicabile, valori sostitutivi da usare in caso di invalidità dei dati di SCADA. [Outcomes: 1,3] APP.01.BP3 : *Verifica di attendibilità e correzione dei dati.* Per ogni tratta identificata come facente parte del calcolo, effettuare una verifica di attendibilità dei dati forniti da SCADA. In caso di valori anomali, effettuare la sostituzione secondo i criteri definiti in configurazione [Outcomes: 2] APP.01.BP4 : *Forzature manuali*. Ove necessario, sostituire manualmente i valori rilevati da SCADA e ritenuti inattendibili o non telerilevati ma ritenuti significativi per il calcolo del Line-Pack. In questo caso ottenere i dati tramite altre fonti (contatti telefonici, comunicazioni via fax, ecc.) [Outcomes:3,4,5] APP.01.BP5 : *Calcolo dell Line-Pack*. Calcolare il Line-Pack complessivo aggregando i valori di Line-pack delle singole tratte e utilizzando i dati prelevati da SCADA e/o sostituiti automaticamente o manualmente. Archiviare i dati risultanti dal calcolo [Outcomes: 6] APP.01.BP6 : *Fornitura dei dati di Line-Pack alla sala Dispacciamento*. Fornire i dati agli operatori della sala dispacciamento per il monitoraggio della rete [Outcomes: 7] APP.01.BP7 : *Fornitura i dati di Line-Pack alle operazioni commerciali*. Fornire i dati alla Direzione Operazioni Commerciali per le elaborazioni relative alla fatturazione[Outcomes: 8]

Indicators: Work Products

Work Products	
Inputs	**Outputs**
Data from SCADA system	Line-Pack variations
Configuration parameters	Historical data
Data input manually	Records of manually input data

READY TO GO !!!

- The team was briefed on ISO/IEC 15504 before building the PRM and PAM
- Schedule:
  - 2003.10.08 – PRM and PAM definition
  - 2003.10.09 – Data collection and validation
  - 2003.10.16 – Attribute rating and feedback session
  - Back office work for Report preparation (1 day +)
  - 2003.11.16 – Results presentation to sponsor

The result – Level 5

PA 5.2	F
PA 5.1	F
PA 4.2	F
PA 4.1	F
PA 3.2	F
PA 3.1	F
PA 2.2	F
PA 2.1	F
PA 1.1	F
Process id	APP.1
Process name	Calculate Delta Line-Pack

F	Fully Achieved
L	Largely Acchieved
P	Partially Achieved
N	Not Achieved

- ✓ Level 1 - Performed
  - ✓ Evidence of execution (BP & WP)
  - ✓ Purpose achieved
- ✓ Level 2 - Managed
  - ✓ Process was planned and execution monitored
  - ✓ Results were documented and under configuration control
- ✓ Level 3 - Established
  - ✓ Process defined in QMS procedure
  - ✓ Tailored to circumstances
- ✓ Level 4 - Predictable
  - ✓ Performance measured
  - ✓ Results used to control process
- ✓ Level 5 - Optimizing
  - ✓ Continuous improvement
  - ✓ Change control

Rating rationale

- Level 1 - The process clearly achieved its purpose by maintaining a steady gas pressure in the network. All work products were readily observable.
- Level 2 - The process was extremely well planned and managed. It was performed precisely every hour taking into account all the data from the field. The work products (actions on the network, reports, etc.) were all clearly identified, verified and maintained.
- Level 3 - The standard process was defined in work instruction, part of the QMS documentation. It was also supported by automated tools (software) with embedded rules. It adapted itself to different circumstances. The deployment rules were mostly defined in the software but were also known to the operating room staff.

Rating rationale

- Level 4 - The process was under quantitative control since the acceptable pressure range was precisely defined and measured. Any deviation from expected results was immediately acted upon, automatically or by human intervention.
- Level 5 - The continuous improvement was testified by the way lessons learned were fed back into the system. The supporting software was continuously enhanced with new rules. Changes were validated prior to live operations.

Lessons from the first experience

- It is technically feasible to apply ISO/IEC 15504 to the assessment of non-software processes
- Measurement framework demonstrated its value:
  - staff understood the conceptual model,
  - management obtained a clearer understanding on how process capability could be measured
  - Sponsor obtained clear information on process capability
- Sponsor appreciated the approach and decided to extend the experience to other processes

The second process

Process ID	**AP.02**	**Updated on**	05-01-12
Process Name	**Estimate fuel gas consumption in pumping stations**		
Process Purpose	The purpose of the process is to estimate the fuel gas consumption based on a transportation budget provided by shippers.		
Process Outcomes	As a result of a succesful implementation of the process: 1) A transportation scenario (forecast of functioning of the pumping stations) is generated based on the trasportation forecast and functional status of the network 2) An annual and quarterly forecast of the daily fuel consumption is produced based on historical data 3) An information database is maintained (updated) containing parameters related to the functioning of the network (network configuration)		

Base Practices for AP.02

Base Practices	**AP.02.BP1 : *Previsione delle medie giornaliere in ingresso/uscita*** . Per ogni mese oggetto della previsione viene determinata la media giornaliera di trasporto (differenziando giorno feriale da giorno festivo) considerando il budget mensile di trasporto ed i dati consuntivi giornalieri del corrispondente mese dell'anno precedente. [Outcome: 1,2] **AP.02.BP2 : *Creazione dello scenario*** . Sulla base delle medie giornaliere stimate e sulla base delle informazioni relative alle condizioni ed i vincoli della rete di trasporto, viene sviluppato uno scenario di trasporto ed una previsione del funzionamento delle centrali e delle unità di compressione. [Outcome: 1] **AP.02.BP3: *Previsione annuale del consumo fuel***. Sulla base dello scenario convalidato, viene generata una previsione annuale del consumo fuel. Il consumo previsto per il trasporto viene integrato con altri consumi (es. gas disperso, ecc..) [Outcome: 2] **AP.02.BP4: *Forcast trimestrale***. Trimestralmente viene prodotto un consuntivo del consumo che riporta le motivazioni degli scostamenti ed una nuova previsione di consumo per il restante periodo. In caso di variazioni sostanziali al budget di trasporto o nelle condizioni di rete, viene ripetuta la generazione degli scenari al fine di ottenere una nuova previsione di consumo fuel. [Outcome: 2] **AP.02.BP5: *Aggiornamento configurazione parametri di calcolo***: I parametri di calcolo vengono aggiornati sulla base di modifiche proposte dalla unità organizzativa preposta (CENT). I parametri ritenuti non attendibili (sulla base di un'analisi dei dati consuntivi) vengono segnalati alla stessa per una verifica sul campo. [Outcome: 3]

Work Products for AP.02

Work Products	
Inputs	**Outputs**
Updated gas transportation budget	Updated estimation of fuel consumption (daily)
Infrastructure cofiguration and constraints (unavailability, structural constraints, maintenance activities, etc..)	Forecast of functional performance for pumping stations
Modulation criteria	Quarterly forecast
Historical data (daily fuel consumption from previous years)	Warning messages to CENTR about reliability of parameters related to pumping stations
Change requests for network configuration	

Scheduling

- 2004.11.22 (kick-off meeting)
- 2004.12.16-17 (briefing e start of assessment)
- 2005.01.12-13 (completed assessment, rating e feedback session)
- Back office – report preparation
- 2005.01.20 Presentation of results

Differences from the first assessment

- Maintained a more detailed record of findings (assessment indicator)
- Used the part 5 indicators as a check-list recording evidence found or missing
- Analyzed reasons for not achieving higher levels
- Identified improvement actions for levels 3 and 4
- Expansion of process scope (include activities from other organizational unit)

Capability profile for AP.02

F	Fully achieved
L	Largely achieved
P	Partially achieved
N	Not achieved

PA 5.2	N
PA 5.1	N
PA 4.2	N
PA 4.1	N
PA 3.2	L
PA 3.1	L
PA 2.2	F
PA 2.1	F
PA 1.1	F
Process id	AP.02
Process name	Estimate Fuel Gas Consumption

Attribute 3.1 - Weaknesses

- Some operating rules were not clearly documented in QMS procedure
- QMS procedure required activities from other organizational unit. No evidence of their acceptance/approval
- Some informal guideline documents on the process were available informally and not referenced by QMS procedure
- Requirements for human resources competencies were not clearly stated

Attribute 3.2 - Weaknesses

- Records of staff competencies were incomplete – mostly based on direct knowledge of people working in th O.U.
- This was tied to a weakness in 3.1

Level 4 considerations

- No quantitative control of the estimate (eg. delta between estimation of fuel consumpion and actualized data)
- What is the business goal supported by this process ? (eg. reduce cost of fuel). What type of performance measurement can be tied to it ?
- Is it possible to maintain this process under quantitative control ?
  - Unpredictable factors such as whether conditions in various part of the network
  - Reliability of data from shippers
- Is the process too narrow ? Granularity issue.

Lessons learned

- It is probably easier to achieve higher level capabilities in industrial (repetitive) processes as opposed to engineering (more ad-hoc) processes (eg. software)
- The granularity of a process may impact the achievement of higher levels
- If process is too narrow it is more difficult to tie process performance goals with business goals
- If process is influenced by unpredictable external factors can we say that its performance is under control ?

Thanks for your attention ! Questions ?