Where did the requirements come from? A retrospective case study

Itzel Morales-Ramirez[1,2], Matthieu Vergne[1,2], Mirko Morandini[1], Luca Sabatucci[1], Anna Perini[1], and Angelo Susi[1]

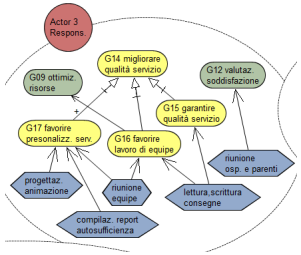
[1]Center for Information and Communication Technology, FBK-ICT
Trento, Italy
[2]International Doctoral School ICT- University of Trento, Italy

Workshop RIGIM'12 at ER'12
17/10/12

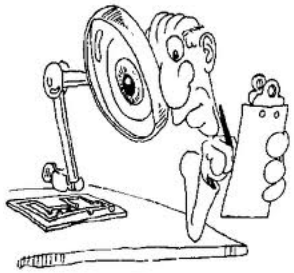
FONDAZIONE BRUNO KESSLER

Outline

- Motivation



- Study design & Execution

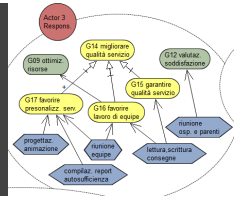


- Threats & Lessons learned

- Conclusions

FONDAZIONE BRUNO KESSLER

Goal-oriented models



- Widely used but industry expects empirical evidence of usefulness
- Illustrative case studies, for example:
  - 19 practical experiences presented in iStar Showcase '11
  - 10 empirical studies using Tropos, over 9 years (troposproject.org)

FONDAZIONE BRUNO KESSLER

Concrete motivation

- When starting a new project:
  - What are the adequate elicitation techniques?

  - Is the use of GO modelling suitable?

  - Can we get some evidence from previous experience in developing complex system?

FONDAZIONE BRUNO KESSLER

Retrospective case study?

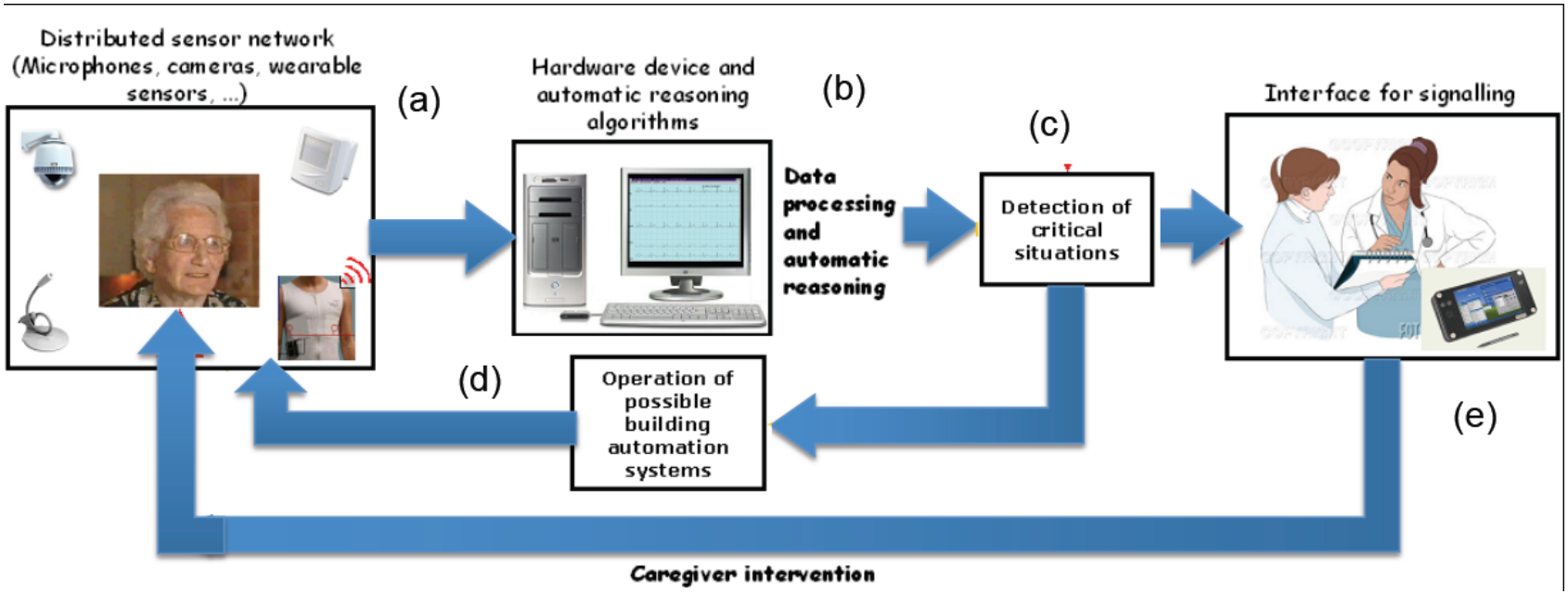
- Case study. Empirical method aimed at investigating contemporary phenomena in their context [Runeson09]

- Retrospective. Looking back on past events or situations [Oxford Dictionary]

FONDAZIONE BRUNO KESSLER

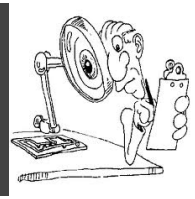
The object of study

- ACube project



FONDAZIONE BRUNO KESSLER

The study: Research questions



- RQ1. Which **information sources**, among stakeholder interviews and domain documents**, are relevant** for the **different types of knowledge captured** in early-requirements goal models?
- RQ2. How did the **different information sources contribute** to model elements in **different abstraction levels** of a GO model?
- RQ3. In which way did **goal models and information sources contribute to the elicitation** of system **requirements**?

FONDAZIONE BRUNO KESSLER

The study: Procedure (1)

- Retrieving of available documents
  - Domain document (*Carta dei Servizi*)
  - Transcription of 8 interviews
  - Early-requirements expressed as goal elements

#	Goal	Cor... b	Att... Req	Ruolo Primar	Att... D	Ruolo Secondo	Aspetti Critici	Fonti
G13	Presentare budget		A05	La provincia fornisce un budget alla RSA	A01	Il dirigente si impegna a usare il budget per fornire servizi assistenziali agli anziani e ai malati di Alzheimer		
G14	Migliorare la qualità del servizio		A3	Coordinare i servizi forniti all'interno della struttura	A1	c'è un qualche tipo di controllo?		
G15	Garantire continuità del servizio	G14	A3	Deve assicurare che il servizio assistenziale fornito sia privo di discontinuità temporali				
G16	Favorire lavoro di equipe	G09, G14	A3	Deve proporre metodologie per ottimizzare il lavoro di equipe e lo scambio di informazioni				
G17	Favorire personalizzazione del servizio	G14	A3	Deve proporre che si adottino stru... metodolo... progettar... individu...				
G19	Intensificare rapporti umani	G18	A10	...rare ...noscere gl... un c... dist... famil...		Necessitano di qualcuno con cui parlare		
G21	Gestione d... emergenze			L'op... ...re deve ...nire in caso si ...ergenza e trovare una soluzione	A4	Richiesta di aiuto, soccorso		
G22	Fornire intervento sanitario	G24	A07	periodicamente controlla lo stato di salute e definisce delle terapie individuali da somministare agli ospiti del centro.				
G24	Cura del proprio caro		A15	La famiglia vuole che il proprio caro sia assistito e curato nel migliore dei modi	A3	Il resposabile della struttura stabilisce dei criteri di ammissione e si fa garante delle cure		

EarlyReqV1

ID	Requisito	Requirement	Domande aperte	Tipologia	Categoria ISO 9126	Categori...	Motivatio...	Mapping con RT
R021	Il sistema identifica quando un ospite "si allontana" dal gruppo	The system identifies when a guest is dismissing the group	Qual è il range di attenzione?	funzionale		monitoraggio diurno	G07	
R023	Il sistema identifica quando un ospite cade	The system identifies when a guest has fallen		funzionale		monitoraggio diurno	G01,G07	
R024	Il sistema identifica quando un ospite ha ...ergenza sanitaria	The system identifies an health emergency		funzionale		monitoraggio	G27	
R025	Il sistema identifica quando un ospite ...llontana dal centro senza autorizzazione	The system identifies when a guest is leaving the institute without authorization		funzionale		monitoraggio diurno	G07	
R026	Il sistema effettua un ...gio notturno dei parametri vitali dell'ospite	The system monitors bio parameters during the night		funzionale		monitoraggio notturno	G01,G27	
R027	Il sistema effettua ...monitor... dell'attività notturna dell'ospite	The system monitors night activity of guests		funzionale		monitoraggio notturno	G01,G27	
	...sistema ...l'...percett... degli operatori in base al...	The system can evolutionally increase caregiver perception range as a consequence of events occurred	Si richiesta dell'operatore? Quando ci sono pochi operatori nel centro? Quando ci sono delle aree del centro non coperte da nessun operatore?	funzionale		apprendimento e predizione	G07,G10,G14	
	...sistema ...isce diverse categorie di compromissi... dell'ospite	The system handles several categories of guests		funzionale		profilazione ospiti	G17	RT16, RT20, RT26, RT09, RT08
R0...	...sistema ...iconosce diversi ruoli all'interno del centro	The system handles several roles of caregivers		funzionale		coordinamento equipe	G16	RT17, RT18, RT08, RT09
R035	...sistema può riassegnare in maniera dinamica alcuni ruoli in caso di necessità	The system can dynamically manage role assignment		funzionale		coordinamento equipe	G09,G16	RT61, RT17, RT18, RT21, RT22
R036	Il sistema avvisa gli operatori di eventi rilevanti	The system alerts caregivers of relevant events		funzionale		interfaccia con operatori	G10	RT26, RT03, RT58
R037	Il sistema individua l'operatore "più vicino" al luogo in cui appare l'evento rilevante	The system locates the nearest caregivers to the place where the event occurs	Qu... criterio? ...pia... ...e zone?	funzionale		coordinamento equipe	G10	RT61
R038	Il sistema identifica il ruolo responsabile della gestione dell'evento	The system identifies the role suitable to manage an event		funzionale		coordinamento equipe	G10	RT21, RT22
R039	Il sistema allerta gli operatori di emergenze	The system alerts caregivers of emergencies		funzionale		interfaccia con operatori	G10,G21	TR04, RT25, RT26
R040	Il sistema aiuta gli operatori a coordinarsi per un intervento	The system helps caregiver... ...ordinating for a... activity or an emergency		funzionale		coordinamento equipe	G21,G16	RT08, RT09
R041	Il sistema gestisce il profilo informativo di ogni ospite	The system handles the user ...ry guest the institute		funzionale		profilazione ospiti	G17	RT09
R042	Il sistema compila un report delle attività degli ospiti	The system ...le to create a ...ort of ...tivities extraordinar...ents or emer...		funzionale		report	G16,G17	???
R043	Gli operatori completano e validano i report compilati dal sistema	...lete and valid... ...em reports		funzionale		report	G16	RT27, RT31, RT32
R044	Gli operatori possono visualizzare "velocemente" i report secondo "vari criteri"	Caregivers ... ...d rapid... ...isualize report with different cri...	Quali sono i criteri desiderabili per ottenere informazioni utili? Filtraggio in base a ospite, data, tipo di informazione?	funzionale		report	G16,G17	RT30, RT23, RT25
R045	Il sistema gestisce il profilo infermieristico di og... ...ite con il piano delle terapie	The syste... ...dies the health user profile for each gue... ...ing the therapy		funzionale		profilazione ospiti	G17	RT08, RT33
R046	Il sistema proattivamente informa l'operatore di informazioni "rilevanti" sull'ospite	...system proactively alert the caregivers with relevant information about the guest	Vedi sopra: quali informazioni sono utili e quali sono superflue? Qual è la frequenza di avvisi che può dare fastidio?	funzionale		interfaccia con operatori	G01,G07,G10	RT27, RT31, RT32

FONDAZIONE BRUNO KESSLER

The study: Procedure (2)

- RQ1 Relevant information sources
  - **Counting the traceability links**

#id	Activities	Source
a01	Enrollment of patients	CartaServizi
a03	Control daytime	CartaServizi

#id	Goals	Source
G14	Improve the quality of service	EarlyReq analysis
G15	Ensure continuity of service	EarlyReq analysis

+ Activities **+ Goals**

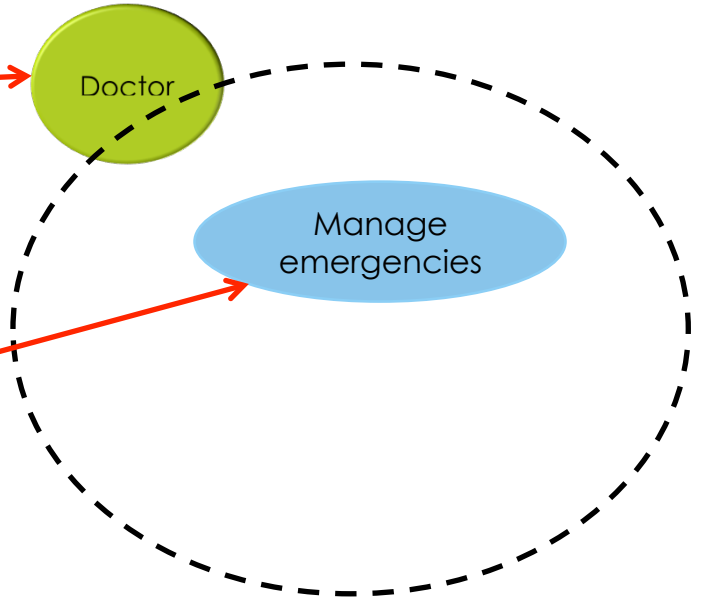
FONDAZIONE BRUNO KESSLER

The study: Procedure (3)

- RQ2 Contribution of different information sources (model)
  - **Rebuilding** the goal model

#id	Actors	Source
A03	Doctor	CartaServizi

#id	Goals	Source	Responsible
G14	Manage emergencies	DOC01RSA	A03
G15	Promote service customization	DOC01RSA DOC03RSA CartaServizi	A01



FONDAZIONE BRUNO KESSLER

The study: Procedure (4)

- RQ3 Contribution of goal model Vs. information sources (requirements)
  - **Identifying the sources** of requirements

#id	Requirements	Source
R021	The system identifies when a patient "move away" from the group	G07
R023	The system identifies when a patient falls	G01, G07

#id	Goals	Source
G07	Ensuring security center	DOC01RSA
…	…	…
G12	Controllo diurno	EarlyReq analysis

FONDAZIONE BRUNO KESSLER

The study: Results (1)

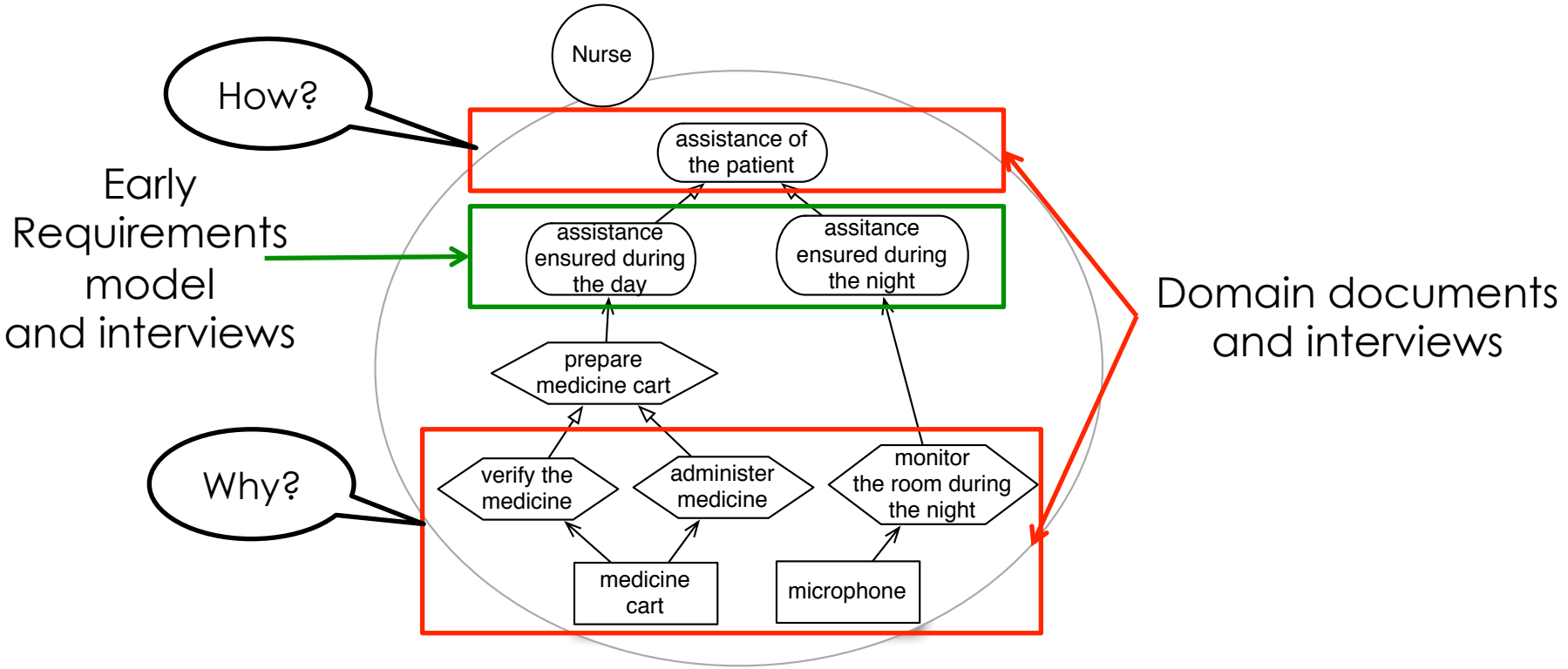
- RQ1. Which **information sources**, among stakeholder interviews and domain documents, **are relevant** for the **different types of knowledge captured** in early-requirements goal models?

Information source	**Goal model elements**				
	actors	activities	resources	goals	sum
Domain Document *Carta dei Servizi*	5	24	3	3	35
Interviews	18	15	18	10	61
Tropos Early Requirements Model	0	0	0	12	12
Total number of elements used in the Tropos model	20	27	19	24	90
Elements found using more than one source	3	12	2	1	18

FONDAZIONE BRUNO KESSLER

The study: Results (2)

- RQ2. How did the **different information sources contribute** to model elements in **different abstraction levels** of a GO model?



FONDAZIONE BRUNO KESSLER

The study: Results (3)

- RQ3. In which way did **goal models and information sources contribute to the elicitation** of system **requirements**?

Goal	Actor	Source	# of functional req.
G01 (provide nursing care)	A10 (social operator)	Interv. to coordinator	5
G07 (guarantee safety)	A10 (social operator)	Interv. to coordinator	13
G09 (optimise resources)	A03 (responsible)	Interv. to responsible	1
G10 (intervene promptly)	A10 (social operator)	Interv. to physiother.	11
G14 (improve the quality of service)	A03 (responsible)	Early Req. analysis	2
G15 (guarantee continuity of the service)	A03 (responsible)	Early Req. analysis	1
G16 (promote teamwork)	A03 (responsible)	Early Req. analysis	7
G17 (promote service personalisation)	A03 (responsible)	Early Req. analysis	6
G21 (manage emergency situations)	A07 (medical doctor)	Early Req. analysis	2
G22 (provide clinical surgery)	A07 (medical doctor)	Early Req. analysis	4
G23 (guarantee continuity of clinical surgery)	A15 (relatives)	*Carta dei Servizi*	2
G27 (manage clinical emergency)	A04 (guest)	Early Req. analysis	3
		Total	57

FONDAZIONE BRUNO KESSLER

The study: Threats to validity

- Construct validity
  - Intentional: selection of input and output artefacts
  - Representation: analysis of traceability links
  - Observation: counting of items following the links + Lucene tool
- Internal validity
  - Analysis performed by the authors not involved in the project
- External validity
  - No generalization but feasibility to be applied to similar complex systems

FONDAZIONE BRUNO KESSLER

Lessons learned

- Lessons learned
  - Different way of performing a retrospective analysis
  - How to exploit information sources (UXD + RE techniques)
  - Mixed top-down and bottom-up techniques are used in practice
- Recommendation
  - Analysts
    - Adding timestamps to improve the quality of the documentation

FONDAZIONE BRUNO KESSLER

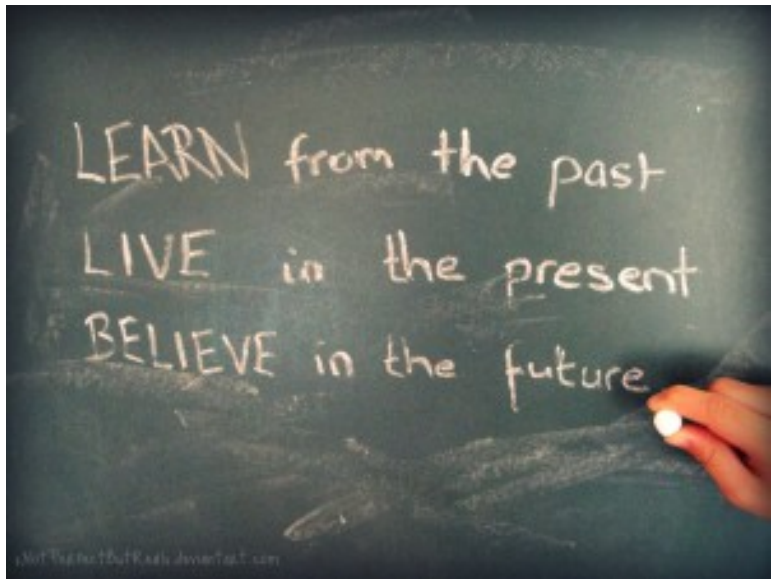
Conclusion & further research

- Conducted a retrospective case study
- Presented the evidence of combining information sources
- Confirmed the source of requirements
  - Interviews + GO models
- **Further research:**
  - Investigated the RE process used in ACube
    - RQ3 investigated: Does the requirements elicitation process, as reconstructed from the empirical analysis of the available documentation, comply with the theoretical process envisaged for the project?

FONDAZIONE BRUNO KESSLER

Thank you for your attention!

- Any questions?

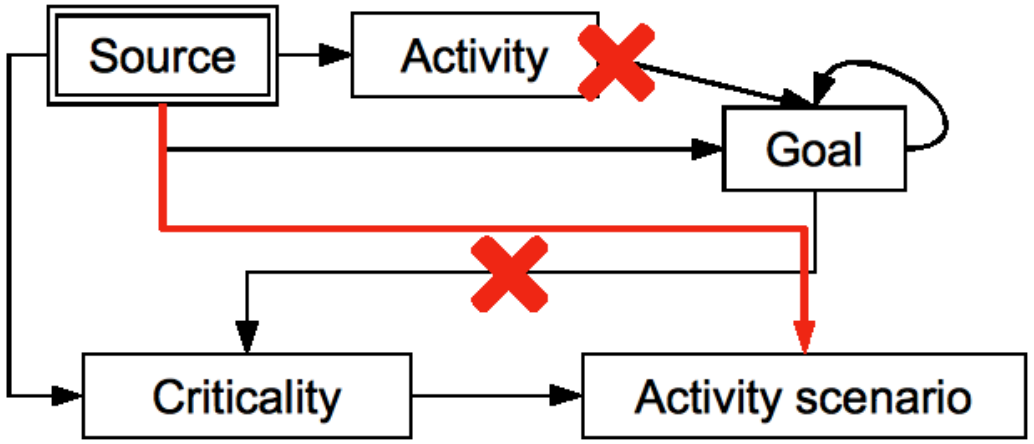


Source: http://www.magerempowerment.com/v2/blog/?tag=positive-past-experiences

FONDAZIONE BRUNO KESSLER

Results- RQ3

- Does the **requirements elicitation process**, as reconstructed from the empirical analysis of the available documentation, **comply with the theoretical process** envisaged for the project?
  - Globally compliant
  - Interviews -> activity scenarios
  - Bottom-up evidence



From EMPIRE12

FONDAZIONE BRUNO KESSLER

References

[Runeson09] Per Runeson and Martin Höst. Guidelines for conducting and reporting case study research in software engineering. Empirical Software Engineering, 14(2):131–164, 2009.

FONDAZIONE BRUNO KESSLER

Images

- http://t1.gstatic.com/images?q=tbn:ANd9GcQgQkK0elQq6KrnilVAOk56vFGua9bh2oY_56dCEMHxuTvDzl6eKA
- http://imagenes.es.sftcdn.net/es/scrn/65000/65461/sweet-home-3d-19.jpg
- http://t3.gstatic.com/images?q=tbn:ANd9GcQDJ4XCJZYnJRt8895TELoJ4JaTq43aTpTFXaJXj31NhzuV-mLF
- http://img.tfd.com/wn/03/62B0E-magnifying-glass.jpg
- http://lirent.net/wp-content/uploads/image/spyware.jpg
- http://t0.gstatic.com/images?q=tbn:ANd9GcQ_aE8gATyuWS_IYCOUJgYe0bxlniFhFzHNAahpWq_cSIFWFASZ
- http://cdn1.lttttmstatic.com/wp-content/uploads/How-To.jpg
- http://t2.gstatic.com/images?q=tbn:ANd9GcRyJ7-uqOCTHNyNG0n5Qxt0LvB9zNr_NyTrb3bmZCmdaJlXmtha