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Web application requirements:
quality models and creativity sessions
as requirements identification techniques

Luisa Mich

e tourism

www.economia.unitn.it/etourism
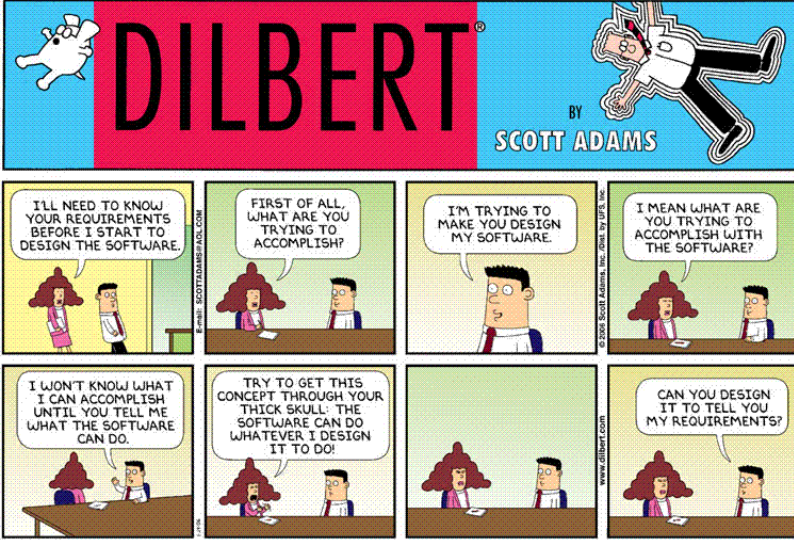
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Schema

- Requirement identification for Web applications
- Role of requirements in systems success or failure
- General techniques for requirements identification
- Techniques to improve requirements identification for Web applications:
  - Web site Quality Models
  - Creativity Fostering Techniques (CFTs)

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Requirements analysis in Web application development

- Requirements analysis has been recognized as a critical phase in SW/IS development but Web site/application development poses unique difficulties related to four fundamentals facts:
    - Strategic role of Web sites
    - Market and technological evolution/changes
    - Presence of several diverse components in a Web site
    - Variety of stakeholders

Strategic role of Web sites

- Given the high level of competition existing on the Web, simply being present on-line does not guarantee that a site's sponsors will reach their objectives for and through the site

- Often the creation of the Web site coincides with the birth of the company whose business model does not foresee a physical location nor an articulated organizational structure (consider for example, virtual banks)

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Market and technological evolution and changes

- The pressures of time and continuous changes in the market and technological environment call for innovative solutions to maintain competitiveness, thereby imposing ever tighter demands on time and resources: Web site requirements are particularly fast changing

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Presence of several diverse components in a Web site

- They require a multidimensional, systemic approach and a multidisciplinary development team: a successful Web site will be the fruit not only of ICT experts, but also of experts in business, marketing, creative design, and representatives from the field or domain itself (professionals from the tourism field, for example, for the site of a tourist organization)
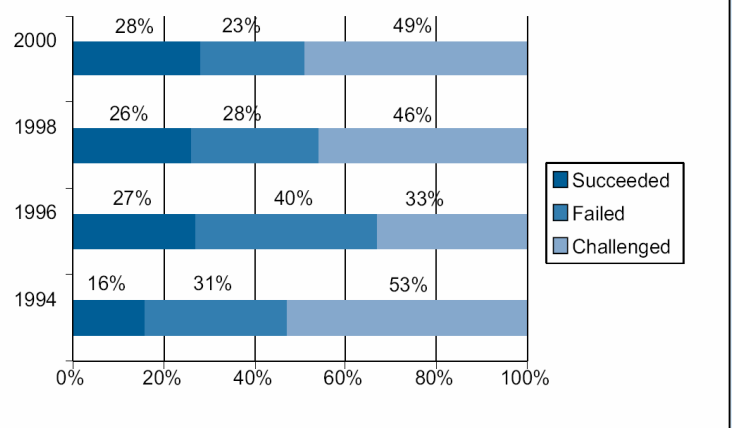
Variety of stakeholders

- The design and use of a Web site involves a wide spectrum of actors or "stakeholders" both internal and external to the company
- Web sites have a potentially wider and more differentiated target consumer base:
  - users can play different roles (employee, client, consumer, company – as in B2B applications – etc, developer);
  - users can have very different profiles, characterized by different languages, cultures, education, computer proficiency, etc.

Role of requirements in IS success

- "Information System (IS)" projects often fail
- IS success or failure depends for 1/3 on factors related to requirements

Project Resolution History (1994–2000)

- 2000: 28% Succeeded, 23% Failed, 49% Challenged
- 1998: 26% Succeeded, 28% Failed, 46% Challenged
- 1996: 27% Succeeded, 40% Failed, 33% Challenged
- 1994: 16% Succeeded, 31% Failed, 53% Challenged

Project success rates are rising. This chart depicts the resolution of the 30,000 applications projects in large, medium, and small cross-industry U.S. companies tested by The Standish Group since 1994.

Causes of failures of IS projects

- Among the most common factors:
  - Unrealistic or unarticulated project goals
  - Inaccurate estimates of needed resources
  - Badly defined system requirements
  - Poor reporting of the project's status
  - Unmanaged risks
  - Poor communication among customers, developers, and users
  - Use of immature technology
  - Inability to handle the project's complexity
  - Sloppy development practices
  - Poor project management
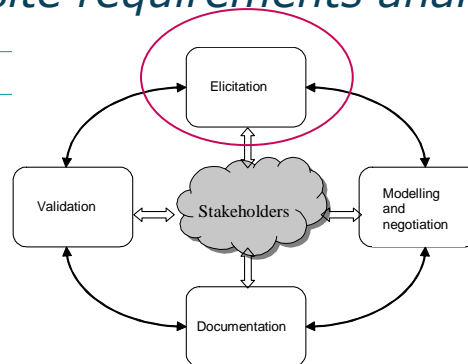 - Stakeholder politics
  - Commercial pressures

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Three main factors of IS failure

Source	Primary Cause	Secondary Cause	Tertiary Cause
CHAOS Report 1994, 365 projects	Lack of user involvement	Lack of executive management support	No clear statement of requirements
The Bull Survey 1998, 203 interviews	Poor communications between relevant parties	Lack of planning	No quality control
OASIG Study 1995, 14000 companies	Lack of attention to human & organizational aspects of IT	Poor project management	Poor articulation of user requirements
KPMG Canada 1997, 1450 companies	Poor project planning	Weak business case	Lack of top management involvement

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IS development phases and relative cost to fix an error

Phase in Which Error Discovered	Cost Ratio
Requirements	1
Design	3–6
Coding	10
Development Testing	15–40
Acceptance Testing	30–70
Operation	40–1000

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Web site requirements analysis

Sommerville & Kotonya, 1998

■ Requirements: identification, acquisition, capture, discovery, gathering, determination, elicitation, invention, generation

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"Fact finding" techniques for requirements elicitation

- Documentation studies
- Research and site visits
- Observation of the work environment
- Questionnaires
- Interviews
- Prototyping
- Joint requirements planning (JRP)
- …

Web site quality models

Creativity techniques

Questionnaires

- Questionnaire: allows the analyst to gather information and opinions from respondents
  - Free-format questionnaire: open-ended question
  - Fixed-format questionnaire: closed-ended questions that require selecting an answer from predefined available responses

Types of fixed-format questions

- Multiple-choice questions

  The implementation of quality discounts would cause an increase in customer orders.
  - Strongly agree
  - Agree
  - Disagree
  - Strongly disagree

  Is the current accounts receivable report that you receive useful?
  - Yes
  - No

- Rating questions

- Ranking questions

  Rank the following transactions according to the amount of time you spend processing them.
  ___ % new customer orders
  ___ % order cancellations
  ___ % order modifications
  ___ % payments

Designing a questionnaire

1. Determine what facts and opinions must be collected and from whom you should get them

2. Based on the facts and opinions sought, determine whether free- or fixed-format questions will produce the best answers

3. Write the questions

4. Test the questions on a small sample of respondents

5. (Duplicate and distribute the questionnaire)

Interviews

- A fact-finding technique whereby the analysts collect information through face-to-face interaction
- The personal interview is generally recognized as the most important and most often used (abused?) fact-finding technique

Types of interviews and questions

- Unstructured interview: conducted with a general goal or subject in mind and with few, if any, specific questions
- Structured interview: the interviewer has a specific set of questions to ask of the interviewee

Conducting an Interview

- Select interviewees
- Prepare for the interview
    - An interview guide is a checklist of specific questions the interviewer will ask the interviewee
- Conduct the interview
- Follow Up on the interview

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Web site quality models as "fact finding" technique

- Interview and questionnaires questions: Web site quality evaluation models as general-purpose checklist of questions

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The 7Loci Model

- Models for the evaluation of quality of Web sites are based on characteristics described using diverse criteria

- We have introduced the 7Loci Model, originally called 2QCV3Q, with the initials coming from the 7 loci of Ciceronian rhetoric on which the model was built: the 7 loci of Ciceronian rhetoric can be interpreted as the 7 fundamental dimensions of a Web site

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Dimensions of the 7Loci

It regards the image that the organization projects or desires to project and therefore all elements that come together in defining the identity of the owner of the site. For example, the brand of the company, a catchy logo, and, in general a graphic layout that is in line with the overall aim of the organization. If the site is targeted at varying categories of users, the ability to adapt the images to different users is also important.

It regards the visibility of a site, that is, everything that contributes to making the site easy to find: an easily remembered address and the use of strategies that make the site easy to find through search engines. This dimension also refers to the ability of the site to offer a space where users can communicate with each other and with the organization

- QVIS   *Identity*
- QVID   *Content*
- CVR   *Services*
- VBI? (Where?)   *Location*
- QVANDO? (When?) *Maintenance*
- QVOMODO? (How?) *Usability*
- QVIBUS AVXILIIS?   *Feasibility*
  (With what means and devices?)

It includes all aspects related to project management: time and budget constraints (also including gathering of data on traffic at the site for eventual cost-benefit evaluations or the calculation of ROI – Return on Investment), skill requirements, architectural choices - e.g., commercial or public domain (open source), the identification of development tools and standards to adopt for site implementation, and the integration with existing technological platforms.

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The 7Loci for Web site requirements identification

- The 7Loci model is used to support requirements identification (elicitation, discovery, gathering) related to the 7 dimensions of the Web sites

LOCI CICERONIANI-DIMENSIONI SITO	Requisiti
QVIS *(Persona:* Who?) **IDENTITÀ**	• Design che renda un'idea immediata di che tipo di albergo si tratta • Storia dell'albergo
QVID *(Factum:* What?) **CONTENUTO**	• Servizi alberghieri • Prezzi • Foto delle camere • Come arrivare • Contatti • Informazioni sulla zona
CVR *(Causa:* Why?) **SERVIZI**	• Possibilità di prenotare e di verificare la disponibilità • Possibilità di pagamento anticipato • Disponibilità di pacchetti (es. skipass compresi nel prezzo) • Newsletter
VBI *(Locus:* Where?) **LOCALIZZAZIONE**	• Intuibilità dell'indirizzo • Presenza nella prima pagina dei motori di ricerca più importanti con parole chiave generiche • Presenza sul portale della destinazione turistica di riferimento
QVANDO *(Quando:* When?) **GESTIONE**	• Aggiornamento rispetto alla stagione turistica • Links interni ed esterni funzionanti • Pagine e immagini facilmente scaricabili
QVOMODO *(Modus:* How?) **USABILITÀ**	• Facilità di utilizzo del sito, di reperimento informazioni, di orientamento del sito (mappa nel sito, "cammino delle briciole") • Qualità delle informazioni • Presenza di diverse lingue

DIMENSION	REQUIREMENTS
Identity	*Appropriate logo* *Colours and photos to transmit a positive image* *Targeted users: families, professionals*
Content	Existence of different sections: • *on the association and on the projects* • *on pain and related therapies* • *on fund-raising* • *for parents* • for professional caregivers Follow the guidelines of "The Health On the Net Code of Conduct" (http://www.hon.ch/Project/HONcode.html) for the quality of medical and health information on the web
Services	Differentiated by user: • parents: on-line guide, forum, guestbook; • professionals: announcements of seminars, courses, conventions, specialisations, bibliography Common services: newsletter, useful telephone numbers, links to related sites
Location	*Intuitive address (containing the name of the association)* *Easily found, thanks to its good positioning on the search engine (clearly defined key words)* *Enable users to interact with the association and its collaborators, with the Webmaster, and with other users* *(virtual community functionalities)*
Maintenance	*Allow users to comment on the site (form, open letters) and benefit from the most interesting suggestions* *Periodic updates of the information done by designated individuals under the auspices of the association* *Display date of creation and of last update* Complete functionality and correctness Technical/technological maintenance
Usability	*Provide instruments to facilitate navigation* *Employ commonly used hardware and software* Consider needs of the disabled (W3C, use of "Bobby Validator") *Use clear and simple terminology (possibly a glossary)* Provide translation in other languages (at least in English)
Feasibility	*Technical Resources:* • ... *Human Resources required:* • ... *Financial Resources:* • *projected budget: from 2,500 to 15,000 Euro annually for management* • costs incurred to date: near zero

Sum

The 7Loci model and the requirements gathering techniques

7Loci model

| Meetings with the owner | Interviews to users | Analysis of "competing" Web Sites |

Requirements of the Web site
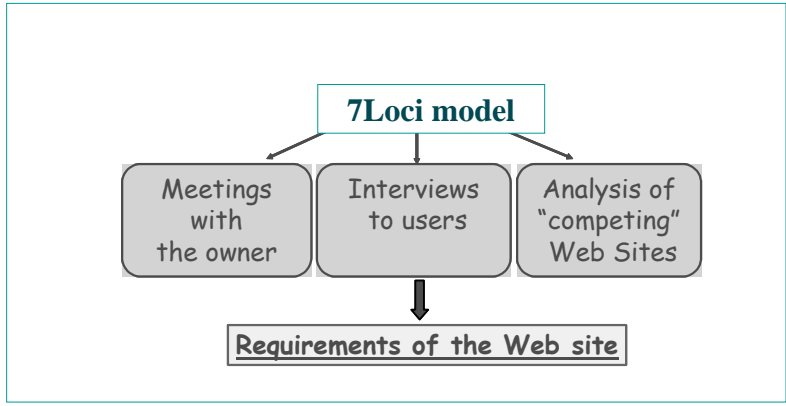
Joint requirements planning and creativity techniques

- Joint requirements planning (JRP): structured group meetings conducted for the purpose of analyzing problems and defining requirements (JRP is a subset of Joint Application Development (JAD), a more comprehensive technique that encompasses the entire systems development process)
- One of the goals of a JRP session is to generate "ideas" to solve a problem
  Creativity fostering techniques

Creativity as problem solving

- A definition of "creativity" to which the community seems to have converged sees creativity as problem solving
- Creativity is the generation of innovative rather than conventional solutions to the problem at hand
- This definition comprises the identification of high level requirements:
  - for the development of new "functionalities"
  - and the improvement and enrichment of already existing Web sites

Creativity fostering techniques for requirement identification

- To support requirements elicitation we experimented a new creativity technique, EPMcreate
- We compared EPMcreate to brainstorming, a classical CFT which dates back to 1935

Brainstorming

- Brainstorming encourage participants to offer as many ideas as possible in a short period of time without any analysis
  - calls for the presence of a leader and a group of 4-12 participants and
  - has two phases:
    - idea (requirements) generation and
    - idea pruning

Brainstorming for requirements generation

- Requirements (ideas) generation follows 4 rules of participant behavior:
  - Do not judge: it is necessary to be open to all ideas put forth
  - Encourage the unusual: no limits are to be placed on the imagination; incentives should be given to look for new solutions
  - The more ideas the better: the quantity of ideas put forth is more important than their quality
  - Improve on the ideas of others: it is important to make use of others' ideas

EPMcreate

- EPMcreate
  - takes its name from the Elementary Pragmatic Model (EPM), which was developed to describe the patterns of relationships among interacting subjects and to predict their evolution
  - it was devised as a structured CFT suitable for requirements generation

EPMcreate for requirements generation

- According to the EPM, the interaction behavior of two subjects can be described as one of the 16 stereotyped interactions that correspond to the 16 Boolean functions of two variables

- These 16 functions suggest that the requirements analyst look at the problem in the 16 ways the viewpoints, for and against, of two different users or classes of users can be combined, in order to get creative ideas

EPMcreate for requirements generation, cont'd

- A CFT session supported by EPMcreate starts with identification of two users or classes of users (stakeholders) that are relevant for the Web site being designed (e.g., students and lecturers for an e-learning application, or employees and external users for a B2B IS)

- To generate ideas, the analyst assumes, in the standard ordering of the 16 Boolean functions of two variables, all possible combinations of attitudes, for and against, the two stakeholders' viewpoints
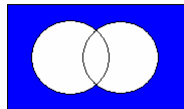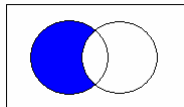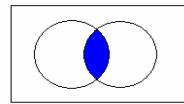
Steps of EPMcreate

- ■ f1: Focus on ideas that are in both stakeholders' viewpoints
- ■ f2: Focus on ideas that are in only the first stockholder's viewpoint
- ■ ...
- ■ f8: Focus on ideas that are outside both stakeholders' viewpoints
- ■ ...

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Experiments to evaluate EPMcreate

- ■ To evaluate the feasibility and effectiveness of EPMcreate we carried out an experiment on each of 2 very different Web application projects:
  - ■ an e-learning Web site (Corsi Online) in use and produced at the University of Trento, and
  - ■ an e-government Web site (Civilia) produced at a nationally known Italian software house.

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Experiments to evaluate EPMcreate, cont'd

- For each project, we compared the performance of two analysis teams, one using EPMcreate and the other using brainstorming, to generate ideas for the project
- The results were analyzed both:
  - quantitatively, counting the numbers of requirements/ideas generated (important because a goal of a CFT is to generate as many ideas as possible); and
  - qualitatively, asking the projects managers of the real projects to rate the newness and feasibility of the requirements ideas

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Experiments to evaluate EPMcreate, cont'd

- Each experiment confirmed the higher effectiveness of EPMcreate CFT

Corsi Online Experiment   Civilia Experiment

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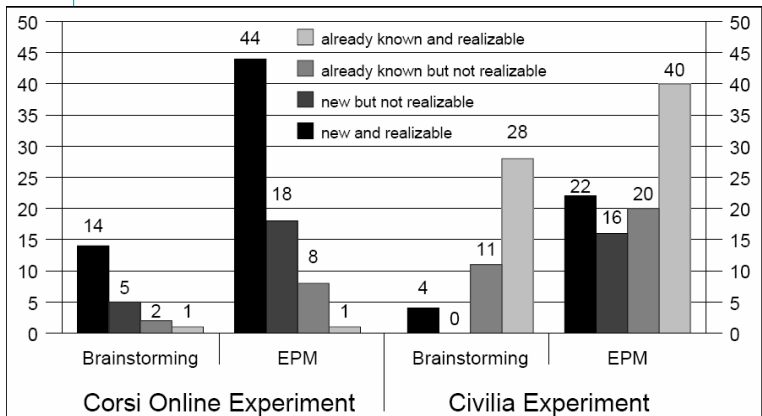
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Conclusions

- Web sites Quality models (7Loci meta-model) can be used to support requirements elicitation: the model facilitated communication with all the stakeholders, providing a common conceptual framework
- While brainstorming is the most well-known and widely used CFT in business environments, the newer EPMcreate proved to be better

Thanks to all of you!

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