Tracing Whodunit

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Abstract

"It was Olly by the water cooler on a post-it!" Being able to trace back to the source of a requirement is often crucial to gain clarification on the requirement and to support any subsequent change. The medium used to capture the requirement at its point of origin and its initial representational form can also convey information that is pertinent to understanding the trace record. However, preparing for the potential to retrieve such seemingly simple information on a project can be sidelined in the rush to engineer an end product, meaning that the ability to undertake pre-requirements traceability is lost. This paper suggests that a familiar whodunit game could be used to raise awareness of this important topic amongst students and practitioners, and be used for team building on projects. It is intended to seed a wider discussion on whether there is a place for a Requirements Engineering Compendium of Games.

1. Introduction and Motivation

Conway's Law suggests that the systems designed by an organization will mirror the structure of the communications within that organization [4]. If we accept this statement, understanding the underlying social structure can reveal many important factors that are likely to influence both the development and evolution of any engineered software product.

Early research in the area of traceability proposed the need to expose the contribution structures underlying a software development project [9]. The motivation was to integrate the artifacts produced with the social structure that produced them, specifically to address inevitable problems of clarification and understanding at a later date. Contribution structures differentiated those parties responsible for documenting, authoring and sponsoring requirements, as well as the other related artifacts, distinctions that provided a hook back into the social network to support a variety of role-based traceability analyses.

More general interest in the use of social network analysis to understand the communication structures and patterns established between participants in software development projects has emerged in the past few years, facilitated by Web 2.0 social networking applications and motivated by the complexities of distributed software engineering settings [8]. A review of this work is outside the scope of this proposal paper. However, despite appealing ideas as to what such a social network can reveal and how this information could be used to improve practice (e.g., to inform developer relocation decisions on global software development projects [18]), there is still frequently too little attention paid to the social aspect in the earliest and most critical stages of a project when such consideration is best built into processes. An engineer is commonly requested to provide meta-data alongside a requirement to identify its source and other details [13]. Yet such information, even where it exists, can be provided inconsistently. Does 'source' mean the originator of the idea behind the eventual requirement, the person who first wrote it down or the person who signed it off? What if this is not an individual but the result of a team decision? The many terms associated with ownership, responsibility and authority on a project can be somewhat nebulous.

Another important and emerging trend in Requirements Engineering has been proposals to use multiple forms of media to help in the gathering and recording of information used to discover and formulate requirements. This is evident in the use of software cinema [5] and those requirements gathering activities undertaken in the workplace using mobile devices [15]. A consequence is that the first recorded trace of a requirement may now be represented in many ways and held in a variety of media. As requirements become articulated more precisely during the course of a project, natural language textual representations are the traditional end product. The media transformations that have taken place that can have significant implications for both content loss and content gain present future traceability problems if not recognized and accounted for in the trace record [10].

This paper and its game proposal is an attempt to raise awareness that both people and media underlie requirements, and that we ought to give these aspects

more thought when it comes to traceability planning. The premise is that it is a lack of shared awareness on the need for and value of useful meta-data that results in the neglect to record it consistently on projects. It is therefore a topic that needs to be raised early on amongst project stakeholders. A familiar whodunit game could be adapted to communicate the message: sometimes we need to be able to track down the source of a requirement and its original form if we are to understand it; we can either make this activity very simple if we plan for it *a priori* by gathering suitable meta-data or we can leave it to trial and error and incur all the delays and complications this later entails. Either way, it is a cost/benefit tradeoff to explore.

Section 2 of this paper provides high-level information about the whodunit genre, Section 3 describes a potential game, and Section 4 outlines the proposed interactive session to be run at MERE 2008 to explore the feasibility and appeal of the concept. The paper concludes with a plea to inject more fun and games into Requirements Engineering, whilst evaluating both where and how this can actually help.

2. Whodunit?

The original and most famous whodunit board game has got to be Cluedo, re-branded as Clue in the USA. Cluedo was first proposed in the 1940s and published by Waddington Games, UK in 1949 [3, 11]. Six players assume the role of detective and use their deductive skills to solve a murder. The game emerged many years after the publication of Sir Arthur Conan Doyle's Sherlock Holmes mysteries [7], and while Agatha Christie's Hercule Poirot and Miss Marple were the fictional detectives of the day [1, 2]. A number of parodies based on this whodunit genre had begun to emerge at the time of Cluedo's invention.

The murder that is at the heart of the original game of Cluedo takes place in the English country house of Dr. Black, in one of nine rooms, and the victim is Dr. Black. The murder was carried out by one of six players, guests in the house and now suspects in the game, using one of six weapons. The objective for the players is to determine whodunit, in which room and with which weapon. Given nine rooms, six suspects and six weapons, there are 324 possible scenarios. The investigation proceeds by the players moving between rooms on the roll of the dice, making suggestions as to whodunit and gathering evidence to eliminate suspects. This simple model has been replicated many times over with numerous versions, editions and titles in the Cluedo franchise [11]. It has been the basis for computer and video arcade games [3], is the inspiration for parties and murder retreat weekends [6], and has even found a place in movie history [12]. It is a well-known classic.

The original game of Cluedo comprises a game board depicting the country house and its nine rooms, colored pieces representing the six suspects, shaped pieces representing the six weapons and twenty-one cards representing each of the rooms, suspects and weapons. A murder envelope, dice, and detective notebooks and pencils complete the game pack.

3. Tracing Whodunit

Tracing Whodunit is a proposal for a detective-like game to uncover information about the original source of a requirement. It builds upon the format and gameplay of Cluedo given that hunting down contributors of early versions of artifacts on a project also relies upon available facts and deductive skills when no supporting traceability has been put in place. A preliminary concept for the game is sketched in this paper, though the intention is that the details would be configured to the players rather than be generic.

The game is meant to illustrate how passing through all the members of a project team in a trial and error fashion to ask a few simple questions to solve traceability issues can take a lot of time, be repetitive and lead down dead-end paths. It is anticipated that players will recognize the need for transparency, either through more oral communication or the recording of salient meta-data, to be more efficient and effective. The broader objective is to get players discussing the role of meta-data on a project, which data is going to be useful for future traceability-related questions and worth recording, while also thinking about approaches to capture and manage this meta-data. These learning objectives will be explored in the proposed session.

3.1 Game Board

A format for the Tracing Whodunit game board is suggested in Figure 1. It represents a typical office complex and shows nine rooms in which the initial requirements capture could have taken place. It is recommended that the game board be tailored to reflect the working environment of the players.

3.2 Game Pieces

The Tracing Whodunit game pieces include six project members (i.e., potential requirements contributors) and six requirements capture tools. Again, it is recommended that the roles and tools be tailored to the players' context, a candidate set being illustrated in Table 1.

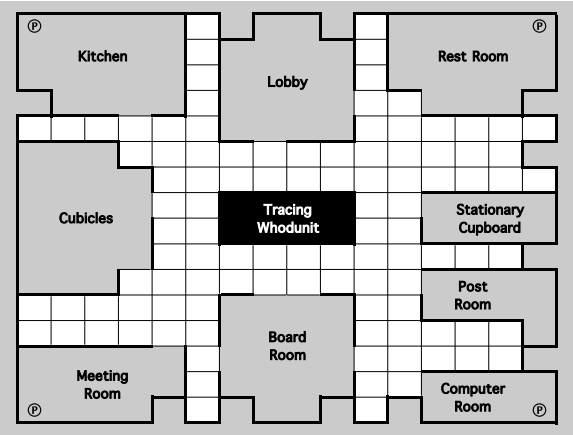

Figure 1. Tracing Whodunit Game Board

The game also requires a deck of cards that represent each of the rooms, project members and tools (as partially illustrated in Figure 2), an envelope to hold details about the requirement under traceability investigation, and pencils and paper for the players.

Table 1. Tracing Whodunit Game Pieces

Project Members (Roles)	Tools
Colin the Customer	Phone
Percy the Project Manager	Video Camera
Tracy the Tester	Whiteboard
Eric the End-User	Envelope (back of)
Debbie the Designer	Computer
Rosie the Requirements Engineer	Notebook

3.3 Gameplay

The Tracing Whodunit game is to be played with a maximum of six players and no fewer than three, each player assuming the role of a project member. At the start of the game, three cards are placed into the requirement source envelope at random – the project member, the tool and the room representing who captured the requirement, in what format and in which location. These are the facts that the players are trying to trace back to. The remaining cards are shuffled and distributed amongst the players. Players then use these cards as a starting point to eliminate rooms, project members and tools from their traceability enquiries.

Starting from the Tracing Whodunit black hole on Figure 1, players roll the dice and move between rooms in the office complex to make suggestions as to whodunit. No diagonal moves are allowed and players cannot occupy the same square as others or pass through occupied squares. Portals exist to move players between corner rooms, replicating the secret passages in the original Cluedo game.

Figure 2. Requirements Capture Tool Cards

Players can only make a suggestion as to the requirement source when they are in the room they are suggesting, so they need to move into the room concerned. They call the suspected project member and tool into the room and announce (for example): *"I suggest it was Colin the Customer in the Post Room on the back of an Envelope"*. This means that the player making the suggestion must be in the Post Room and have positioned both Colin and the Envelope in that room. The player representing Colin will have lost his or her original position on the game board unless this is the player making the suggestion.

Any suggestion that is made leads to a questioning process in which evidence is gathered and deductions are made. In the scenario above, the player who is next to play has to reveal a card that could eliminate Colin, the Post Room or the Envelope from the enquiry. This is done in secret between the two parties. Such questioning proceeds according to the order of play until one player can reveal a card or all the players have been exhausted. While the player making the suggestion could be bluffing and hold any of the cards concerned, others found concealing requested data are eliminated from the game. All the players need to note the suggestions and revelations made in an attempt to make their own deductions. There are obviously strategies that can be employed to impede others, like blocking access to rooms or pulling players into rooms they do not want to be in, a reality that can be faced on projects when trying to track down information. In particular, dragging a project member around an office complex to interrogate as a potential source of requirements knowledge is but a mirror to the frustration that person would feel on a real project if they were constantly pulled off their tasks to field traceability enquiries!

An important distinction is made between making a suggestion about the possible requirement source and making a claim of fact. Each player only has one opportunity to make a claim. They can write down the facts they believe to be true at any time in the game and look in the requirement source envelope. If they are correct, they can reveal the match and they have won the game. If they are wrong, they return the cards to the envelope (unseen by others) and do not reveal their claim. False claims about requirements, reported as facts, are a serious problem in practice, so the now ex-player moves to the Tracing Whodunit black hole and can only assist with future enquiries.

3.4 Game Varieties

The game is intended to be configurable and extensible to address learning needs. It may be desirable to add more rooms, both in the office and in outside locations, or more project members and tools, which would increase the number of options for the source details and extend gameplay time. Other extensions include accounting for accomplices (i.e., all the parties contributing in different capacities to a requirement), accounting for the media representation of the requirement (e.g., natural language text, speech, drawings, etc.), or integrating a project timeline and rationale into the deductive process (i.e., when and why?) A further extrapolation would involve players dressing up to reflect roles, using physical requirements capture tools and moving around an actual office. Real world versions of traditional games, such as Pac-Manhattan [17], increase the engagement in gameplay and so become very memorable.

4. Proposed Session

The proposal is to run an interactive gameplaying session during the MERE 2008 workshop (Multimedia and Enjoyable Requirements Engineering: Beyond Mere Descriptions and with More Fun and Games). Details of this proposed session are provided below.

4.1 Objectives

1. To stimulate discussion and raise awareness about the role of people and media in the Requirements Engineering process, particularly their use and importance from a traceability perspective.
2. To encourage investigation into the potential role, scope and effectiveness of games in Requirements Engineering education and practice, particularly to convey the value of elusive key concepts.
3. To have some interactive role-playing fun!

4.2 Required Participants and Participation

The session requires three to six willing participants. No prior skills are required, just the ability to sleuth and the enthusiasm to discuss the topics. The session will last up to one hour, including ten minutes for set-up, forty minutes for gameplay and ten minutes for wrap-up (approximate timing).

4.3 Session Outline

"Requirement 101 was found ambiguous and not testable by Tracy the Tester on September 9, 2008. Whose requirement is it? Where did it come from? There is no traceability and the origin of the requirement has yet to be established. Whodunit, where and with what? You have all been brought here today in the office complex of RE-R-US to assist Tracy in her traceability enquiries."

4.4 Expected Outcomes

- ***Ice-breaker*** – the session participants will get to interact, so know each other a little better and have started a dialog on traceability and games.
- ***Awareness*** – the session participants will have gained an awareness of important meta-data that can help support some of the most frustrating and time-consuming traceability problems associated with establishing provenance.
- ***Transfer*** – some session participants may be motivated to adapt and try a variant of this game out in their own contexts.
- ***Stimulus*** – most session participants will be provoked, in one way or the other, to think about other gaming ideas relevant to Requirements Engineering and its many problematic topics.
- ***Feedback*** – the session leader will have gained feedback on the feasibility of the gaming ideas discussed in this paper, and suggestions for the development and validation of this proposal. The session outcomes will be summarized for the benefit of the wider workshop contingent.

4.5 Contribution

The contribution is the attempt to encourage the Requirements Engineering community to revisit strategies for instruction and practice that take a more lighthearted approach to serious topics. A Requirements Engineering Compendium of Games might provide an attractive complement to the many conventional resources available for individuals and teams and is part of a vision initiated with RE-O-Poly [16]. The goal is to establish an area of interest.

5. Conclusions and Vision

This paper forms the basis of a proposal to run an interactive game with participants at the MERE workshop of the International Requirements Engineering Conference. The objective is to foster thinking about important concepts (e.g., prioritization, negotiation, risk management, impact analysis, traceability, etc.) and how to leverage alternative ways to raise awareness of their value and techniques. In the case of Tracing Whodunit, the purpose is to encourage people to think about the frustration and cost that can be associated with tracing back to retrieve information about the source of a problematic requirement when this is not planned for and when there is little data at hand. This knowledge is needed to analyze traceability cost/benefits and to develop supporting approaches.

The future is likely to see more imaginative and sophisticated games designed and developed to convey important concepts and to help teach practices in Software Engineering; it is inevitable given the burgeoning Serious Games movement and the growth of the games industry [14]. In the interim, and while we await the innovators of the future, there are many popular games that people around the world have grown up with that could be adapted to provide livelier ways to inform and foster bonds between project team members. The role of games and gameplay in Requirements Engineering has yet to be explored from a research perspective and there are undeniably open questions as to applicability, effectiveness and acceptability that need to be understood. Nevertheless, the potential of gaming is something the Requirements Engineering community is urged to consider, however humble the initial offerings that start this dialog.

6. Acknowledgements

Tracing Whodunit is NOT a commercial game. It is a proposal intended purely for non-profit educational purposes and to seed discussion on the role of games in Requirements Engineering at MERE 2008. Cluedo (Clue) is now published by Hasbro, a leading toy manufacturer in the USA, and readers are directed to their website to explore the brand [11].

The author would like to thank Renel Smith for the lead he has taken in looking at how familiar games can be re-purposed for Requirements Engineering education and training, and hopefully re-enjoyed.

7. References

[1] Christie, A. *The Murder at the Vicarage: Miss Marple Series* (First Published in 1930). Signet, 2000.

[2] Christie, A. *Murder on the Orient Express: Hercule Poirot Series* (First Published in 1934). Penguin Group, 2004.

[3] Cluedo Fan Website. See: *http://www.cluedofan.com/* (accessed July 2008).

[4] Conway, M.E. How Do Committees Invent? *Datamation*, April, 1968.

[5] Creighton, O., Ott, M. and Bruegge, B. Software Cinema - Video-based Requirements Engineering. *Proc. 14th Intl. Conference on Requirements Engineering (RE 2006)*, Minneapolis, USA, pp.109-118, September 11-15, 2006.

[6] Decipher, Inc. *How To Host A Murder®.* See: *http://www.decipher.com/partyzone/howtohost/howtohostamurder/* (accessed July 2008).

[7] Doyle, Sir Arthur Conan. *The Complete Sherlock Holmes*. Doubleday, 1960.

[8] Ehrlich, K., Valetto, G. and Helander, M. Using social network analysis to understand patterns of collaboration and coordination in global software teams. *Proc. 2nd Intl. Conference on Global Software Engineering (ICGSE 2007)*, Munich, Germany, pp.297-298, August 27-30, 2007.

[9] Gotel, O.C.Z. and Finkelstein A.C.W. Contribution Structures. *Proc. 2nd Intl. Symposium on Requirements Engineering (RE 1995),* York, UK, pp.100-107, March 27-29, 1995.

[10] Gotel, O.C.Z. and Morris, S.M. Macro-Level Traceability via Media Transformations. *Proc. Intl. Working Conference on Requirements Engineering: Foundation for Software Quality (REFSQ 2008)*, Montpellier, France, June 16-17, 2008.

[11] Hasboro. See: *http://www.hasbro.com/* (accessed July 2008).

[12] Landis, J. and Lynn, J. (Screenplay); Lynn, J. (Director). *Clue: The Movie*. 1985. See: *http://www.imdb.com/title/tt0088930/* (accessed July 2008).

[13] Robertson, S. and Roberson, J. *Mastering the Requirements Process.* ACM Press, 1999. Also: *http://www.systemsguild.com/GuildSite/Robs/Template.html* (accessed July 2008).

[14] *Serious Games Summit.* Games Developer Conference Materials, San Francisco, USA, February 18-22, 2008. See: *http://www.gdconf.com/conference/sgs.htm* (accessed July 2008).

[15] Seyff, N. Graf, F., Grünbacher, P. and Maiden, N. In-situ Discovery of Requirements for Mobile and Context-aware Systems: How Scenario-based Approaches Can Help. *Proc. Intl. Working Conference on Requirements Engineering: Foundation for Software Quality (REFSQ 2008)*, Montpellier, France, June 16-17, 2008.

[16] Smith, R. and Gotel, O. Gameplay to Introduce and Reinforce Requirements Engineering Practices. *Proc. 16th Intl. Requirements Engineering Conference (RE 2008),* Barcelona, Spain, September 8-12, 2008.

[17] St. John, W. Quick, After Him: Pace-Man Went Thataway. *The New York Times (Style),* May 9, 2004.

[18] Ye, Y., Nakakoji K. and Yamamoto, Y. Measuring and Monitoring Task Couplings of Developers and Development Sites in Global Software Development. *Proc. 2nd Intl. Conference on Software Engineering Approaches For Offshore and Outsourced Development (SEAFOOD 2008),* Zurich, Switzerland, July 3-4, 2008.