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Social Network Analysis of a Participatory Designed Online Foreign Language Course

Meenakshi Sundaram Rajasekaran

Panayiotis Zaphiris

School of Informatics, City University,
London EC1V 0HB,
United Kingdom.
sundar_slm@rediffmail.com

The Centre for Human-Computer
Interaction Design,
School of Informatics, City University,
London EC1V 0HB,
United Kingdom.
zaphiri@soi.city.ac.uk

Abstract

People intensive social systems like WBT (Web-Based Training) Systems are open natured and behave unpredictably with their environment. In other words, these systems are less responsive to well defined scientific methods. Hence a shift in focus from technical to non-technical approaches like Social network analysis (SNA) which is principally used in communication science, is necessitated. This study attempts to evaluate the applicability of Social Network Analysis (SNA) as an analytical and empirical method to analyse the interactions within the online community belonging to a Greek language for English speakers online course. The key objective of this study is to test a hypothesis that relates to the Participatory Design Methodology employed while developing this specific course.

1. Introduction

Some of the important concepts relating to this study are Web-based training systems (WBT), Online communities, Participatory Design (PD) methodology from the field of Human Computer Interaction (HCI), Social Network Analysis (SNA) and Netminer, the tool used for performing network analysis. A discussion of these topics is therefore important and the depth of discussion is curtailed pertaining to their association.

2. Web-Based Training System

Any application of web and communication technologies for the purpose of imparting knowledge or skill to someone is referred to as Web-based training. WBT enables one to obtain and deliver knowledge anytime, anywhere using a combination of the Internet and other communication technologies. The WBT system used in this study is 'Learn Greek Online' found at <http://kypros.org/Greek>.

3. Online Communities

For the assessment of this WBT System, the online community belonging to the discussion forum at 'Learn Greek Online' system, is chosen as analysis. An online community can be defined as, a group of people with common interests who exchange ideas and words, or share emotions, predominantly over the Internet via electronic media like chat, email, online discussion boards etc.

4. Human – Computer Interaction (HCI)

The primary focus of HCI on human-computer based systems like WBT and discussion boards is to provide maximum usability to the ultimate users of a system. This, HCI aims to achieve by designing and developing a systems with a user-centered approach. HCI is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them (Shneiderman, 1997).

4.1 Participatory Design (PD) in 'Learn Greek Online'

PD is a key technique from HCI that emphasizes active and seamless involvement of users at all stages of a system development. PD is the methodology underpinning design and development of 'Learn Greek Online' system at <http://kypros.org/Greek>. The rationale behind the usage of PD is said to be motivation, commitment and satisfaction of users (Zaphiris & Zacharia, 2002b).

4.2 Hypothesis

By involving users actively during the design and development phases of a system, a sense of ownership can be cultivated within the users, which consequently will influence them to play key roles in the system.

The extensive use of PD in design and development of 'Learn Greek Online' WBT System makes the hypothesis applicable in here (Zaphiris & Zacharia, 2002a). By testing the above hypothesis one can ensure that up fronting time and effort in Participatory Design (PD) can be significantly rewarding and consequently motivate system owners to implement PD, in the ongoing process of system improvement and maintenance.

5. Social Network Analysis (SNA)

Although Social network analysis (SNA) up to now has been principally used in communication science (Garton, 1999:76) for evaluating face to face communities, we think that its strengths can be of use in evaluating virtual communities too.

"Communities rely on relationships for their growth ..." (Preece, 2000). A community dwells on the notion of relationship and analysts have tried and established SNA as an empirical method to study social networks. In recent years, research has been carried out to test and demonstrate the applicability of SNA concepts in online communities (Preece, 2000:173).

Social network analysis (SNA) is the study of social relationships between a set of actors. SNA uses various concepts to evaluate different network properties like centrality, connectivity, cliques etc, each of which pertain to particular dimension of the network. This study has employed a few of these important concepts in testing the hypothesis and to reveal any useful implications over the system's performance.

5.1 Properties of social networks (Hanneman, 10-06-2002)

5.1.1 Degree of an actor: This is the number of connections an actor has with others in the network. This directly assists in establishing whether the actor forms a bottleneck in the flow of information within the system.

5.1.2 Degree centrality: This assesses the power of an actor based on number alters (other actors) that actor is directly connected to. If an actor receives many ties (aka relationships) or makes contact with many others then the actor is said to have high-prestige or high influence, respectively.

5.1.3 Cliques: A clique is a sub-set of actors in a network, who are more closely tied to each other than to other actors who are not part of the sub-set. Cliques focus on closely connected groups. They can aid in understanding how large social structures are built upon smaller and tighter components.

5.2 Netminer

Owing to voluminous calculations, this study has employed a GUI based computer tool called Netminer, to perform network analysis.

6. Methodology

In any online community there are two phases involved, namely *population phase* and *evolution phase*. The initial postings in the discussion board of Learn Greek online are associated with the initial population phase, which is rich in interactions and it is the set of postings that were subjected to analysis in this study.

The postings were carefully examined, categorized and tabulated with different details of posting made (e.g. originator and recipient of the post). From this table, information is transformed in the form of a data set, usable by Netminer for performing SNA. User's identity was masked with dummy identity to mitigate the concerns of privacy intrusion.

Examining these postings resulted in a list of 43 online community members who form the social network for this study of which 5 are from the Participatory Design Team (PDT). PDT refers to those involved in the design and development phases of 'Learn Greek Online' system.

7. Analyses and Results

A rigorous analysis has revealed many useful information from which constructive inferences and assertions can be made. A constraint matrix developed on this data reveals that 5 of the users impose most restriction on the other users, of which 3 belong to the participatory design team. Also a '*Reachability Matrix*' demonstrates another important property of the network, that every actor in the network is reachable by every other actor.

An in-degree visualization of the community at scale five, groups, 2 of the 5 PD team users at the centre (Figure 1, U17, U21), depicting that they have the highest in-degree amongst 2 others. Another PDT user (U19) is plotted at the next level showing high interaction level. As in the case of in-degree analysis, PDT-Users, U17, U19 and U21 are plotted as part of the most central actors. Thus both in-degree and out-degree centrality analysis unmistakably denotes that PDT-Users have been playing key roles in the community.

Figure 1 : In-degree graph (Scale 5)

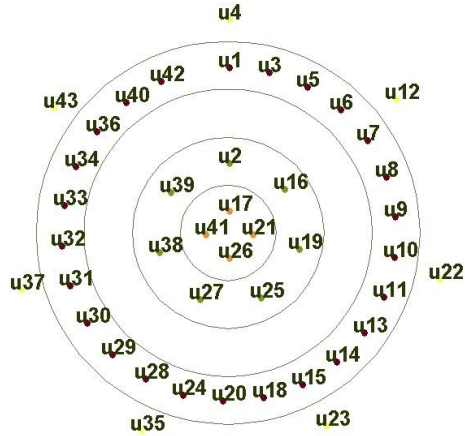


Table 1 : Clique Analysis Report

Cliques	Members	Cliques	Members
K1	(u17, u19, u21, u26, u27, u12, u13)	K19	(u17, u19, u21, u26, u27, u25)
K2	(u17, u19, u21, u26, u27, u12, u14)	K20	(u17, u19, u21, u26, u27, u4)
K3	(u17, u19, u21, u26, u27, u12, u15)	K21	(u17, u19, u21, u26, u27, u5)
K4	(u17, u19, u21, u26, u27, u7)	K22	(u17, u19, u21, u26, u27, u28)
K5	(u17, u19, u21, u26, u27, u8)	K23	(u17, u19, u21, u26, u27, u29)
K6	(u17, u19, u21, u26, u27, u9)	K24	(u17, u19, u21, u26, u27, u30, u43)
K7	(u17, u19, u21, u26, u27, u10)	K25	(u17, u19, u21, u26, u27, u31)
K8	(u17, u19, u21, u26, u27, u11)	K26	(u17, u19, u21, u26, u27, u33)
K9	(u17, u19, u21, u26, u27, u6)	K27	(u17, u19, u21, u26, u27, u34)
K10	(u17, u19, u21, u26, u27, u16)	K28	(u17, u19, u21, u26, u27, u35)
K11	(u17, u19, u21, u26, u27, u1)	K29	(u17, u19, u21, u26, u27, u36)
K12	(u17, u19, u21, u26, u27, u18)	K30	(u17, u19, u21, u26, u27, u37)
K13	(u17, u19, u21, u26, u27, u2)	K31	(u17, u19, u21, u26, u27, u38)
K14	(u17, u19, u21, u26, u27, u20)	K32	(u17, u19, u21, u26, u27, u39)
K15	(u17, u19, u21, u26, u27, u3)	K33	(u17, u19, u21, u26, u27, u40)
K16	(u17, u19, u21, u26, u27, u22)	K34	(u17, u19, u21, u26, u27, u41)
K17	(u17, u19, u21, u26, u27, u23, u32)	K35	(u17, u19, u21, u26, u27, u42)
K18	(u17, u19, u21, u26, u27, u24)		

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Sub-group analysis focuses on tightly knit components that satisfy certain criteria. Participation of network members in these closely-knit components in turn indicates a strong involvement of actors in the network. A subgroup analysis shows a group of 5, as those who are present in all of the 35 cliques formed in the network. This can be verified from the cliques table which lists all the 35 cliques (Table 1, K1 to K35) and their participating member list.

To strengthen the value of results, a filter of at least 3 interactions was imposed to the above clique analysis. And the results clearly demonstrate that the 5 actors (3 of whom are PD team members) have very strong relationships with every other actor in the network, forming crucial part of the network.

8. Conclusion

All of the above demonstrate that the PDT-Users who have been employed in the design and development phases of 'Learn Greek Online', have established long-term relationship, enduring interests, playing a vital role in the system. This signifies their sense of ownership over the system. This hence is in support of the initial hypothesis.

Hence by up-fronting effort and investment in the form of involving users (as in Participatory methodology) during the early phases of design and development of a system, can not only help in increasing the usability of a system, but also motivate them to have a long term relationship with the system.

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