An Overview of Doing a Triangulation of Perspective on Digital Communities

Yılmaz ALIŞKAN [1] (iD)

[1]Dr., Communication Faculty, Dicle University, Diyarbakır/Türkiye

Corresponding Author: yilmaz.aliskan@dicle.edu.tr

Abstract

Purpose – In this article, I explore how to do a triangulation of perspective on the practice of communities in which developers take part in the production of software and hardware designs. I explain the combination of three different data collection and analysis methods such as virtual ethnography, social network analysis and critical discourse analysis. The paper aims to show how an ethnographic method integrate into the digital field in which face to face communication does not play a key role in digital communities.

Design/methodology/approach – Free open-source communities are chosen as samples for case study to explain how a virtual ethnography, which is supported by social network analysis and critical discourse analysis, apply for online communities.

Findings – This article provides information to the researcher about the opportunities and challenges of virtual ethnography in the research process. Digital archive enables the researcher to collect data even though s/he is not over there when discussions are done. Without face-to-face communication, it is possible to do virtual ethnography on the internet. The paper shows that digital platforms are important places to collect data for virtual ethnography, social network analysis and critical discourse analysis. The paper also illustrates how to manage combined research methods in the digital field.

Originality/value – This paper discusses the strengths and weaknesses of combined research methods in digital research. It also explains in detail how virtual ethnography adapts to online communities, in which there is no face-to-face communication.

Keywords: virtual ethnography, social network analysis, critical discourse analysis

Dijital Topluluklara Üçlü Metot Perspektifinin Düzenlenmesine Genel Bir Bakış

Oz

Amaç – Bu makalede üçlü metot perspektifin yazılım ve donanım tasarımı üretme sürecine katılan geliştiricilerin olduğu uygulama topluluklarına nasıl düzenlendiğini araştırıyorum. Sanal etnografi, sosyal ağ analizi ve eleştirel söylem analizi gibi üç farklı veri toplama ve analiz yöntemini birleştirerek açıklıyorum. Bu makale, yüz yüze iletişimin anahtar bir rol oynamadığı dijital topluluklarda etnografik bir yöntemin dijital alana nasıl entegre edildiğini göstermeyi amaçlamaktadır.

Tasarım/metodoloji/yaklaşım – Özgür açık kaynak toplulukları sosyal ağ analizi ve eleştirel söylem analizi tarafından desteklenen sanal etnografiyi açıklamak için vaka çalışmalarının örneği olarak seçildi.

Bulgular – Bu makale, araştırmacıya sanal etnografinin araştırma sürecindeki fırsatları ve zorlukları hakkında bilgi sağlar. Dijital arşiv, araştırmacının tartışmalar yapılırken orada olmasa bile veri toplamasını sağlar. Yüz yüze iletişim olmadan da internet üzerinden sanal etnografik araştırma yapmak mümkündür. Makale, dijital platformların sanal etnografi, sosyal ağ analizi ve eleştirel söylem analizi çalışmaları yapmak için önemli veriler sağlayan yerler olduğunu gösteriyor.

Özgünlük/değer – Bu makale, dijital araştırmadaki birleşik araştırma yöntemlerinin güçlü ve zayıf yanlarını tartışıyor. Ayrıca makale sanal etnografinin yüz yüze iletişimin olmadığı çevrimiçi topluluklara nasıl uyum sağladığı ayrıntılı olarak anlatıyor. Makale aynı zamanda dijital alanda birleşik araştırma yöntemlerinin nasıl yönetileceğini de gösteriyor.

Anahtar Kelimler: Sanal Etnografi, Sosyal Ağ Analizleri, Eleştirel Söylem Analizi

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Dijital Topluluklara Üçlü
Metot Perspektifinin
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Bakış

Genişletilmiş Özet

Giriş

Bu makalede üçlü metot perspektifinin dijital alan çalışmalarına nasıl uygulanabileceği ayrıntılı bir şekilde açıklandı. Başta sanal etnografi olmak üzere, sosyal ağ analizleri ve eleştirel söylem analizinin birlikte bir araştırmada nasıl kullanılabileceği gösterildi. Sanal etnografinin klasik etnografiden farkı ortaya konulduktan sonra sanal etnografinin avantajları ve kısıtlılıkları tartışıldı. Sosyal ağ analizleri ve söylem analizleri ana metot olan sanal etnografiyi desteklemek için kullanıldı. Dijital toplulukların çalışma şekillerinin veya topluluk içinde yaşanan güç ilişkilerinin ortaya çıkarılması sanal etnografinin ilgi alanlarını oluşturabilir.

Metot

Bu çalışmada dijital toplulukların sanal etnografi yöntemiyle nasıl inceleneceği tartışıldı. Sanal etnografinin dijital topluluklar üzerindeki çalışmaları belirli örnekler üzerinden devam ettirilmesi gerektiğinden yapılacak çalışmanın evrenini temsil edebilecek örnek topluluklar seçilmesi gerekmiştir. Özgür açık kodlu topluluklar örnek vaka çalışmaları yoluyla ele alınmış ve uygulama toplulukları olarak özgür ve açık kodlu topluluklara sanal etnografinin nasıl uygulanacağı detaylı bir şekilde açıklanmıştır.

Tartışma ve Sonuç

Dijital arşivlerde depolanan veriler sanal etnografik çalışmada etkili bir şekilde kullanılabilmektedir. Araştırmacılar dijital toplulukların iletişim kurabilmek için kullandığı e-mail listeleri ve forumlar içinde depolanan dağınık ve biçimsiz halde bulunan verileri organize edip araştırma için anlamlı bir bütün haline getirmeleri en zorlu alanların başında gelmektedir. Bu yüzden sanal etnografik çalışmalarda gözlem yoluyla elde edilen verilerin yanı sıra sosyal ağ analizleri yoluyla veya kelime bulutları yöntemiyle dijital arşivler kategorize edilebilir. Sosyal ağ analizleri yoluyla elde edilen veriler dijital topluluklar içerisinde bulunan üyelerin grup içerisinde e-mail trafiğini kontrol ederek grup içerisinde baskın olan üyeleri bulabilmektedir. Araştırmacılar sanal etnografinin bir parçası olarak topluluk içerisinde daha aktif olan üyelerle derinlemesine görüşmeler yaparak daha detaylı ve zengin verilere ulaşabilir. Dijital arşivlerde topluluk üyelerinin konuşmaları veya tartışmaları araştırmacı tarafından okunması çok fazla zaman alacaksa araştırmacı kelime bulutları yöntemiyle arşivde en fazla kullanılan kavramları bulabilir. Ayrıca derinlemesine görüşme yoluyla elde edilen veriler dijital arşiv yoluyla elde edilen verilerle karşılaştırılarak öne çıkan kavramlar eleştirel söylem analizi yöntemiyle analiz edilebilir.

1. Introduction

The internet as a mass-self communication tool provides individuals with a useful platform to create digital communities in which they can develop a collaborative production model in the digital field (Castells, 2013). Open source communities are communities of practice where developers who live in different parts of the world come together to produce open source products (Weber, 2004). Developers have a strong motivation to get a reputation in this community (Raymond, 2001). They, therefore, have tendency to be one of the most active contributors in the production process. This tendency in collaborative production is supported by digital communication tools such as mailing lists, forums, social media groups and so on.

Digital communication tools enable researchers to collect valuable data as the message traffic shared on the digital platforms is stored. Researchers can look at stored discussions as of the early days of the community even though researchers have not been in the community at that time. Digital media in this sense provides researchers with a new opportunity to adapt ethnographic research into the digital field. Gathering data from digital archives such as mailing lists and forums can be used in qualitative research (Pink et al, 2016). Researchers can apply virtual ethnography to analyse open source communities. To find the most active contributors in communities, researchers can do a social network analysis on digital platforms. Researchers have richer data on when they can conduct interviews with more active contributors. Social network analysis also lists the members of a community of practice from the most active to the least active. This analysis can give details about the power relations in the community.

The method is important in the research as it guides the way in which researchers have undertaken the research, bringing forward some aspects of the research domain researchers are interested in and by necessity backgrounding others. Whenever one selects a methodology, it is important to recognise the extent to which this creates a particular perspective on a research question, which has to be taken account of reflexively in the research. In order to try to balance out this methodological effect, researchers can seek to use a number of different approaches in the method. This is important for a number of reasons: (1) it allows a multi-perspective approach to the research questions, enabling a triangulation of perspectives which deepen the understanding of the problem domain, (2) one of the problems with researching digital communities, such as free open source communities, is that there is simultaneously too much information – usually from mailing lists, amongst others – and not enough data – usually as a result of the reluctance of informants to provide interviews, or when they do, giving short or limited answers to the questions, (3) this methodological approach has also allowed me to cross-fertilize the research as findings from one method; for example, the concordance and content analysis of the mailing lists can be used to provide a conceptual input into the critical discourse analysis of the interview data to help develop topics, concepts and categories for researchers' work.

Overall, virtual ethnography can be a primary method in the research, allowing a deeper analysis. Researchers' aim is to build a framework for understanding online communities, informed, as it is, by this wider analysis of the discourse of collected data and interviews. To further understand online communities, researchers can, therefore, look at discussions on the mailing list regarding the roadmap of the projects and communities. In this way, researchers may also discuss the opportunities and challenges of online communities with the help of virtual ethnography, social network analysis and critical discourse analysis.

2. Method

In this research, a case study is used as a method to explain how virtual ethnography is applied for digital communities. Free open source communities are selected as sample cases to collect data in the process of analysing digital communities. This research focuses on how a combined research method applies to digital communities. It is time to briefly define a case study to emphasise and highlight its scope and features. Robert K. Yin explains case study research with a twofold definition.

A case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result, relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result, benefits from the prior development of theoretical propositions to guide data collection and analysis (Yin, 2014: 17).

The case study inquiry enables researchers to manage multiple sources of evidence that facilitate the understanding of digital communities. Researchers can apply multiple case studies so that they could investigate digital communities as a contemporary phenomenon and within a real world context.

3. Findings and Discussion

3.1- Virtual Ethnography

The central method in a triangulation of perspective on free open source communities can be virtual ethnography. The internet-based ethnography is a relatively new sort of method, especially in the field of humanities and social science. Virtual ethnography is becoming popular in internet-based research. The internet-based ethnography is explained as follows:

An ethnography of the Internet can look in detail at the ways in which the technology is experienced in use. In its basic form ethnography consists of a researcher spending an extended period of time immersed in a field setting, taking account of the relationships, activities and understandings of those in the setting and participating in those processes (Hine, 2001: 4-5).

To do a virtual ethnography on a specific subject, researchers should find proper samples that give researchers valuable data in the analysing process. Virtual ethnographers should then select interesting cases regarding online communities. At this point, researchers should be able to properly explain how or why those sample cases are selected to justify the methodological process in the research.

For ethnographic research of free open source communities, researchers should choose specific open source communities as case studies to gain the primary data and to make the research process much more manageable. The internet contains millions of online communities currently active on the internet. With research on limited time, it proves impossible to look at all digital communities active in limited time. For this reason, researchers can pick up on at least two free open source communities to do a comparative analysis.

Free open source software or hardware is a movement based on online communities where developers and designers come together to become part of the production, distribution and consumption processes of open source projects. Even if the movement organises offline events like summits, conferences or creates hacklabs to come together physically, online activities are the primary communication strategy between developers, typified by forums, mailing lists, chat groups, and so on (see Coleman, 2013; Kelty,

2008). It is claimed that the free-open source movement is based on a new kind of production model, the so-called commons-based peer production (CBPP) model (Benkler, 2006). This model has been very successful in parts of the software industry, and increasingly, in the hardware sector. Researchers may look at how the CBPP model is applied to software or hardware products, power relations between developers in the community, tensions between the free open source movement and capitalism, the role of the communication process within the production model, and the opportunities or challenges of free open source products for society, hobbyists, children and education.

To understand these issues, researchers use ethnographic research focussed on the online activities of free open source hardware developers and designers. Unlike classic ethnography, as mentioned before virtual ethnographers do not have to communicate face-to-face with their informants who provide primary data to the researchers. Hine continues:

It is possible for an ethnographer sitting at a desk in an office (their own office, what's more) to explore the social spaces of the Internet. Far from getting the seats of their pants dirty, Internet ethnographers keep their seats firmly on the university's upholstery. The lack of physical travel does not mean, however, that the relationship between ethnographer and readers is collapsed (Hine, 2001: 45).

Virtual ethnography enables the researcher to observe and collect data on online communities and websites. For a virtual ethnographer, digital space becomes the terrain of all issues concerning digital culture. In some cases, individuals create online communities where communication or connection is made in a digital way. Without face-to-face communication, people can interact with others on the internet; further, internet users can set up digital platforms for themselves to play an active role in the production, distribution, and consumption of digital goods (Castells, 2013). Researchers' main concern in understanding the free open source movement is to analyse online communities where free open source goods are produced by developers. Initially, researchers should join in online communities to collect data in an active way.

Participant observation is a crucial data collection technique for ethnographic research as researchers have to join the discussions in communities to get deep details (Cruz, 2017). Asking questions to peers in communities is an important part of virtual ethnography. At the same time, researchers should observe the activities of developers in the digital field. In particular, the conversations among developers on the internet may provide rich detail of the tensions between peers. Robert V. Kozinets denotes computer-mediated ethnography as "netnography" and explains the four main features of netnography:

First, and perhaps most obvious, is alteration. Alteration simply means that the nature of the interaction is altered — both constrained and liberated — by the specific nature and rules of the technological medium in which it is carried. Next is anonymity, that widely-analysed difference, particularly relevant in the early years of online interaction, but still meaningful today. The wide accessibility of many online forums to participation by anyone is the third crucial difference that our revised techniques must accommodate. Finally, there is the automatic archiving of conversations and data facilitated by the online medium (Kozinets, 2010: 68).

Virtual ethnography is a comprehensive method applied to the digital field, especially in online communities, where the nature of interaction or communication is altered. The free open source movement is just one of the examples of this alteration. Producers do not feel they need a physical workplace where they physically come together and communicate

face-to-face with their peers; instead, people can be organised in online communities to manage the production, distribution, and consumption of digital goods.

Developers in free open source communities may prefer not to declare their identities in online communities. On mailing lists, many developers can use nicknames for flexibility. Anonymity, in some ways, helps developers to share their ideas without self-sensorship. However, this is a serious challenge for researchers to find out the real identity of developers using nicknames. Even though researchers do not use personal information of developers in the research, it is important to note that developers using nicknames can provide misleading information to researchers on research. Researchers have to be careful at this point. If researchers observe peers in the community for a while, it can be much easier to find proper interviewees who provide reliable primary sources to researchers.

In this regard, it is important to note that most developers may not be interested in being an interviewee for research in the field of humanities or social science. Researchers should write a standard message and send it to developers inviting them to be part of the research. When developers reply to the message, if researchers accept to be part of the research, researchers should send another message to organise a day and specific time which should be suitable both the researcher and the developer. If the developer declines to be an interviewee, the researcher should say "thank you" and should not send another message to the developer to convince him/her. In case the developer does not reply to the first message, the researcher can send two more messages to contact him/her. The third message should be the last message sent to the developer as the fact that the researcher is too insistent may make feel developers to be in an unsafe environment. This causes an ethical problem for the research as the researcher should not harm the ecosystem of the community in which peers feel safe. When the developer accepts to be an interviewee, the researcher should arrange a video meeting with the developer. The researcher must make the meeting with the interviewee on time.

Distribution of information in online communities is easier than in offline communities. The most important thing is that all data on the internet is automatically archived, and this data offers the researchers great opportunities to conduct virtual ethnographic research, which is an effective method to analyse the exercise of power relations and cultural production in free open source communities. Digital archive, in this respect, includes digital items such as code, designs, comments, suggestions, arguments, discussions, news, articles, photos, and so on. All these items have direct or indirect meanings for virtual ethnographic research, social network analysis and critical discourse analysis. Kelty explains:

Indeed, as a methodological aside, one reason it is so easy to track such stories and narratives is because geeks like to tell and, more important, like to archive such stories—to create Web pages, definitions, encyclopedia entries, dictionaries, and mini-histories and to save every scrap of correspondence, every fight, and every resolution related to their activities. This "archival hubris" yields a very peculiar and specific kind of fieldsite: one in which a kind of "as-it-happens" ethnographic observation is possible not only through "being there" in the moment but also by being there in the massive, proliferating archives of moments past (Kelty, 2008: 114-115).

The data can be supplemented by analysis of the communities' websites and developers' mailing list archives, but researchers should participate in mailing lists and forums to observe conversations and discussions. The researcher can benefit from digital archive for virtual ethnographic research if s/he, at the same time, is an active peer in the community. This can be a problem for virtual ethnography if the researcher can collect

data from mailing lists archives and forums as ethnographic research requires participant observation.

3.2. Social Network Analysis
Social network analysis can be the first analytical technique in qualitative research. What researchers do with social network analysis is to create a list showing the name, e-mails and the number of developer activities on the mailing lists. Kozinets provides a meaning:

Social network analysis is an analytical method that focuses on the structures and patterns of relationships between and among social actors in a network. In social network analysis, there are two main units of analysis: 'nodes' (social actors) and 'ties' (the relations between them). A network is composed of a set of actors connected by a set of relational ties. The actors, or 'nodes', can be persons, teams, organizations, ideas, messages, or other concepts. The term 'tie' or 'relation' can be used interchangeably to describe the link between actors (Kozinets, 2010: 49).

The developers become "nodes" of social network analysis since they are social actors of the mailing lists. The relations or interactions between developers are called "ties" or "edges" in social network analysis. Nodes acquire a score, illustrating how popular or active developers are on the mailing list. The higher score of a node refers to a more active developer on the mailing list, while the higher score of an edge means a stronger relation between nodes. However, this analysis measures the number, rather than the quality of activities. Social network analysis helps determine the structure of an online community for researchers interested in the participation divide on the digital platform.

Individuals in society are dependent upon each other, and social network analysis provides a framework for modelling interdependence and the associated repercussions for behaviour. Social network analysis is more than a set of methods—it is an orientation towards the understanding of human behavior that focuses on the importance of social relations, as well as the set of tools that enable the investigation of social relations and their consequence (McGloin & Kirk, 2010: 178).

Interactions between peers in communities of practice are the most important part of commons based peer production. Peer production is based on interactive communication between individuals who have a significant motivation to create digital goods. Social network analysis shows how democratic interactive communication is possible in a social network platform in which there is no barrier to joining the platform. Even though there is no barrier, there can be a participation divide between peers arising from various reasons. Researchers can concentrate on the reasons for the participation divide. It is known that free open source communities have a top-down organisational model in which the leader and co-developer play a key role in the decision-making process (Raymond, 2001; Aliskan, 2021).

Online communities based on digital platforms are mostly public, and anyone could join the list or forums without hindrance. Researchers can access mailing lists and forums via the websites of the communities. Chosen communities as case studies help researchers focus on samples. Each mailing list archive used for data collection can be individually saved in a Word document on a private computer. If researchers are not an expert to transfer data from Word to Excel, researchers may receive help from a developer who is an expert in Python programming language. The developer can write a parser in Python to import the data in the Word document into *comma-separated values (*CSV) file. Original e-mails essentially consisted of two parts: headline and the body. Researchers can use the headline of emails, which include sender's name and e-mail address and receivers' names and email address, in the social network analysis, and the body of the emails are the

subject of ethnographic research and critical discourse analysis. Next, the headline data can be imported into a CSV file which includes four columns: ID, source, target, weight; the column of ID shows the name of the member, source includes e-mail address and name of the senders, target refers to receiver's name and email address, weight the number of emails sent to receivers. Researchers can import separately CSV files including the data from mailing lists and forums, into Gephi, a social network analysis tool, and researchers can obtain some network pictures and statistical results from Gephi. Both figures and statistical records show the positions of developers, determined by the number of e-mails they sent and received on the mailing lists. In this way, for each mailing list, researchers obtain a social network analysis list that illustrates the positions of developers, from the most active to the least active, as well as the strength of relations between the developers.

The edges in a social network analysis are significant data that show who has strong or weak relations within a community. The edges mostly refer to a long thread of many users. Most networks comprise a core and periphery structure. While the core is a dominant central cluster, the periphery shows relatively few connections (Borgatti and Everett, 1999). Betweenness centrality, closeness centrality and weighted degree are three types of measurements illustrating the positions of individuals in the network. Betweenness centrality "indicates how often one individual is likely to be an important relay point between other network members" (Hoppe and Reinelt, 2010: 603). Closeness centrality is "the inverse of the average shortest-path distance from the vertex to any other vertex in the graph" (Okamoto et al, 2008: 187). Weighted degree means "degree that takes into account the number of edges that go from one node to another… the total number of interactions of each character with anybody else" (Barbera, 2017). Weighted degree provide researchers with a great opportunity to find the most active users on the mailing lists since it shows "total number of interactions of each character". Researchers, therefore, can take into account the weighted degree of the members of communities chosen as case studies when putting the members in order from the most to the least active.

On the mailing list, some peers may use more than one e-mail address, name, and nickname. These peers, therefore, can be accepted as different persons on the lists, and the statistical results show the wrong rate and figures. Researchers should check all names and e-mail addresses one by one in communities. When researchers realise that the developer uses more than one name or an e-mail, researchers take note of them, and at the end of the checking, researchers should merge different names and e-mails under one developer name and e-mail. If the mailing lists are a little messy; normalisation of data on the mailing lists, as a result, can take a long time. However, the social network analysis for each community provides researchers with a list showing the participation difference between developers. On the mailing list, there can be a wide range of developers with a mail score from one email to 1000 emails. Their score includes the emails sent (out) and received (in). The interviewees can be chosen from the social network analysis list to get rich data for a virtual ethnography.

As mentioned before, the mailing list archives can be messy and hold a large amount of data. To analyse the data more easily in the main body of e-mails, and not the headline parts, the data initially should be cleaned. The mailing list is a digital communication platform where many peers participate in the discussions. When a developer posts an e-mail to the mailing list on a certain topic, the conversation starts under the title of that topic. The critical thing at this point, is that when a developer sends an e-mail to the mailing list that does not start a new topic, the original format of e-mail circulates the new

e-mail together with the former e-mails: a thread. All e-mails are connected. The mailing traffic goes like this: the first e-mail A, the second B with A, the third C with A, B and so on. Therefore, the mailing lists must be cleaned of any repetition within the mailing threads so that the word frequency technique can be applied correctly.

3.3. Critical Discourse Analysis

In order to work with, order and classify the materials, researchers may make use of Critical Discourse Analysis (CDA). This applies to the data gathered from the mailing list archives and the interviews to reveal the power relations in both communities. CDA is defined as "Discursive practices … are viewed as an important form of social practice which contributes to the constitution of the social world including social identities and social relations" (Jorgensen and Philips, 2002: 61). Discourse analysis is necessary for the research in which power relations are a significant element in the analysing process. Virtual ethnographic research can focus on whether free open source communities could create an alternative culture that would transcend the limits set by the intellectual property rights regime and capitalism. The discourse of developers belonging to the communities provided researchers with valuable detail with respect to the opportunities and challenges of the free open source production model as "discourse is a form of social practice which both constitutes the social world and is constituted by other social practices" (Ibid). It is possible to analyse the social relations emerging in developer communities by considering power relations with a discourse analysis technique. Critical discourse analysis helps researchers to reveal social relations that are difficult to see at first glance (Fairclough, 1995).

Conversations on free open source developers' groups give researchers details on the social and political backgrounds of the members of their communities. The concepts chosen and grammatical structures of language in the conversations are important elements in the analysing of social relations at the discursive level. Free open source developers have a specific technical discourse that can be hard to understand for researchers in the field of social science or humanities. However, developers, also, can have discussions regarding the future of the community. Peers mostly have various motivations and ideological backgrounds in the community. Critical discourse analysis is an effective method to unpack power relations in free open source communities.

Researchers should decide the key concepts on the mailing list and interviews. Word cloud technique can be used to normalise the content in the mailing list archive. The researcher can find out the concepts that are frequently used on the mailing list (Heimerl et al, 2014). It is important to note that even though sample cases are part of free open source communities, the discussions on each mailing list can be different. Data in particular communities may be richer and more diverse than others for critical discourse analysis. There can be important discussions in some mailing lists or forums regarding the political economy and cultural side of the free open source movement. The interview data coming from developers can play a key role in the research, which focuses on the social relations of peers in communities. Some mailing lists include conversations on mostly technical issues and technological improvements. These mailing lists are not a suitable platform for developers to discuss the cultural or ideological side of developers in their communities. Therefore, researchers can benefit mainly from the interview data, including the details on the social and cultural sides of the free open source production model.

Researchers can benefit from analysing software such as Nvivo, which is a software tool that facilitates the researcher's work to carry out qualitative analysis effectively[1]. Nvivo can also be used for critical discourse and ethnographic analyses when evaluating data from interviews. Interview data can be categorised on Nvivo, and this makes the analysis process much more manageable (Bazaley and Jackson, 2013). Using software for qualitative research enables researchers to keep the data under control in the analysing process. However, researchers should keep in mind that software tools cannot manage an analysing process, but software helps researchers to do it. Software is not a magical tool that finds a new perspective in the analysing process without the need for the human mind.

When the process of data analysis is done, researchers should write a report including findings, comments and original contributions. The findings should be evaluated in light of the literature review. In this point, researchers should conspicuously design the research structure. The data collected from virtual ethnography should be highlighted in the research as this data is primary source of the research making an original contribution to the literature. Researchers can share findings with their colleagues or present findings at conferences to get feedback. The research is ready to be published when the researcher does corrections in the light of feedback.

4. Conclusion

In this article, I have explained how to apply a triangulate perspective for digital communities. I have also clarified how ethnographic research can adapt to the digital field. Participant observation is the most important part of ethnographic research as the researcher must join in online communities to do virtual ethnographic research. Free open source communities have been chosen as sample cases in virtual ethnography, which has been the main method. Gathering data from digital communities can be easier than offline communities in some points. Free open source communities mostly have considerable data on their mailing lists and forums. In the lists, the developer communicates with one another, discussing problems and solutions, and sharing experience and documents. The amount of data coming from mailing lists is mostly tremendous, with about hundreds of word pages. The researcher can import this data into a software program to analyse. For the normalisation and cleaning process of the data, the researcher can apply word clouds to find key concepts in mailing lists and forums. With the result of the social network analysis, as said before, the researcher can decide who would be interviewees on the mailing lists to gain more detailed data regarding power relations among developers. Critical discourse analysis can be applied to the data coming from mailing lists and interviews in order to analyse the structure of the community and the ideological struggle among the developers.

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[1] Maxqda is another software used for qualitative research. Reseachers can also use it in their researches.

Araştırmacıların Katkı Oranları Beyanı

Araştırmanın tüm aşamalarında yazarlar eşit katkıda bulunmuştur.

Çatışma Beyanı

Yazarın araştırma ile ilgili bir çatışma beyanı bulunmamaktadır.

Reference

Aliskan, Y. (2021). Free and open hardware: a critical and tematic analysis of free and Analysis, *Journal of Criminal Justice Education*, 21(2), 169-181.

Barbera, P. (2017). Social network analysis with R: Descriptive analysis. Pablobarbera.com. Available at: http://pablobarbera.com/big-data-upf/html/02b-networks-descriptive-analysis.html (Accessed: 17 October 2019).

Bazaley, P. and Jackson, K. (2013). *Qualitative Data Analysis with Nvivo*. 2nd edn. London: Sage.

Benkler, Y. (2006). *The wealth of networks: How social production transforms markets and freedom*. United States: Yale University Press.

Borgatti, S. P. and Everett, M. G. (1999). 'Models of core/periphery structures', *Social Networks*, vol. 21(1), 375-395. https://doi.org/10.1016/S0378-8733(99)00019-2

Castells, M. (2013). Communication power. 2nd edn. Oxford: Oxford University Press.

Coleman, G (2013). *Coding Freedom: The Ethics and Aesthetics of Hacking*. Princeton: Princeton University Press.

Cruz, E. G. (2017). *The (Be)Coming of Selfies: Revisiting an Onlife Ethnography on Digital Photography Practices*, L. Hjorth, H. Horst, A. Galloway, and G. Bell. The Routledge Companion to Digital Ethnography (300-308), New York: Routledge. Ethnography: Principles and Practice. London: Sage.

Fairclough, N. (1994). Critical Discourse Analysis: The Critical Study of Language. London: Longman.

Heimerl, F., Lohmann, S., Lange, S. and Ertl, T. (2014). Word Cloud Explorer: Text Analytics based on Word Clouds. 47th Hawaii International Conference on System Science, 1833-1841. https://doi.org/10.1109/HICSS.2014.231

Hine, C. (2001). *Virtual Ethnography*. 2nd edn. London: Sage Publications.

Hoppe, B. and Reinelt, C. (2010). 'Social Network Analysis and the evaluation of leadership networks', *The Leadership Quarterly*, 21, 600-619. https://doi.org/10.1016/j.leaqua.2010.06.004

Jorgensen, M. and Philips, L.J. (2002). Discourse Theory as a Method and Theory. London: Sage Publication.

Kelty, C. M. (2008). *Two Bits: The Cultural Significance of Free Software*. London: Duke University Press.

Kozinets, R. V. (2010). *Netnography: Doing Ethnographic Research Online*. London: Sage.

McGloin, J. M. and Kirk. D. S. (2010). 'An Overview of Social Network Analysis', *Journal of Criminal Justice Education* 21(2): 169-181.

Okamoto K., Chen. W., Li. X.Y. (2008). 'Ranking of Closeness Centrality for Large-Scale Social Networks', Frontiers in Algorithmics. FAW 2008, 19-21 June. Changsha Springer Nature, 186-195. open hardware communities RepRap and Arduino. Doctoral thesis (PhD).

Pink, S., Horst, H., Postill, J., Hjorth, L., Lewis, T. and Tacchi, J. (2016). *Digital Ethnography: Principles and Practice*. London: Sage.

Raymond, E. S. (2001). *The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary. Cambridge: O'Reilly*. University of Sussex.

Weber, S. (2004). *The Success of Open Source. Camridge, MA*: Harvard University

Yin, R. K. (2014). *Case Study Research: Design and Methods. (5th ed.)*. Los Angeles: SAGE.