D-MOVE: A MOBILE COMMUNICATION BASED DELPHI FOR DIGITAL NATIVES TO SUPPORT EMBEDDED RESEARCH

Otto Petrovic
Professor, Dr.
Institute for Information Science and Information Systems, Karl-Franzens-University of Graz
Universitaetsstrasse 15 G/3, AT-8010 Graz, Austria

ABSTRACT

Digital Natives are raised with computers and the Internet, which are a familiar part of their daily life. To gain insights into their attitude and behavior, methods and media for empirical research face new challenges like gamification, context oriented embedded research, integration of multiple data sources, and the increased importance of personal data. The paper presents and evaluates a method based on Delphi technique, which integrates multimedia data capturing in the field with multi-round face-to-face discussions. As the front end, a very fast and fuzzy platform was implemented, which is currently being used by over 100 million Digital Natives. It allows teaching the participants to use embedded research and to understand the impact of self-monitoring for health and fitness on business models, which was one central aim of the supported course. Additionally, it is used to gain insights into Digital Natives' attitude and behavior.

KEYWORDS

Delphi technique, embedded research, self-monitoring, teaching Digital Natives, innovative mobile learning.

1. CHALLENGES IN GAINING INSIGHTS INTO DIGITAL NATIVES' ATTITUDE AND BEHAVIOR

1.1 The Nature of Digital Natives

Table 1. Challenges for media and methods to gain insights into Digital Natives' attitude and behavior.

From	To
Boring	Gamification, Surveytainment, Visual presentation of questions and answers
Slow going	Fast, fuzzy
Questionnaire based research	Context oriented embedded research (use of smartphones)
Question-based	Quests, small tasks, experimental design
'Make' in data gaining	'Buy' and integration of many data sources
Anonymous research	Increased importance of personal data

Digital Natives' mother tongue is the digital language of computers and the Internet (Jones 2011). They are born after 1980, raised with digital technologies and have a high affinity to them. They are used to obtaining information quickly, have a high amount of ad-hoc-communication, work and communicate in form of multitasking and use mostly interactive digital media.

Traditional media and methods of empirical research used to gain insights into Digital Natives' attitude and behavior encounter some special challenges (Hagenhoff 2015) as shown in Table 1. These challenges call for new methods in empirical research and in the use of digital media, a major element of Digital Natives' daily life.

1.2 The Delphi Method as an Approach to gain Insights into Digital Natives

The traditional Delphi method as a means of empirical research gained popularity back in 1948 due to its use by the RAND Corporation for military related questions (Häder/Häder 2000). Linstone/Turoff (1975) defined this method as: „Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem." The main steps are: Formulation of theses about current or future issues, obtaining experts' opinions, aggregating these opinions and presenting them to the expert and finally, starting a second round to obtain consent/dissent about these issues.

A systematic literature review carried out by the authors (see also: de Loë 2016) shows that advanced Delphi methods are modified regarding the type of media used (from paper and pen to digital media), amount of channels used to send out invitations to participate (also email, social media, Lee & McLoughlin, C. 2010, Tapscott & Williams 2008), form of data collected (quantitative and qualitative), types of answers (e.g. multiple choice, comments, upload of pictures and videos, voice annotations), and presentation of results (e.g. graphical, pictures, videos).

Based on the learnings of these innovative forms of Delphi method, the authors designed D-Move Delphi as a first prototype of a Delphi method and communication tool with the aim to fulfill the requirements of Digital Natives as much as possible. An important requirement was the ability to use different front ends like Facebook, WhatsApp, or Snapchat, which are widely used by a certain group of Digital Natives, while D-Move's backend with its storing and sharing functionalities and the implemented Delphi procedures could remain constant (see Petrovic 2016 for an example of a different front end).

2. D-MOVE AS A MOBILE COMMUNICATION BASED DELPHI

To meet the challenges described in chapter 1 the D-Move Delphi offers five central characteristics:

- **The use of a familiar media**. D-Move Delphi uses as front end a communication infrastructure, namely Snapchat, which is very familiar for Digital Natives. As an image messaging and multimedia mobile application, launched mid 2011, it was used by 120 million people by the end of 2015. More than 10 billion videos are viewed daily via Snapchat on smartphones in 2016. 52% of the user base is 16 to 24 years and another 32% between 25 and 34 years old. Thus, it is a real Digital Natives' media and much 'younger' than e.g. Facebook.
- **Fast, fuzzy, and based on gamification**. An annotated picture or video shared in Snapchat with peers disappears after viewing. No archive or communications thread remains. Only with a special feature, the messages can be displayed for an entire day before disappearing. With the use of filters, pictures and videos can be modified and geo-tagged by using gestures. For the purpose of empirical research, D-Move Delphi allows the storing of contributions of each participant in the backend of the application to discuss and interpret them during the face-to-face meetings.
- **Context oriented embedded research.** Because Snapchat is a smartphone-only application, Digital Natives can use it directly in the context of the Delphi thesis. For instance, if a thesis is related to a certain communication pattern, the Digital Native films its real behavior, makes some annotations and shares it with peers. It is no longer necessary to reflect on one's own attitude or behavior in a certain situation while filling out a questionnaire, which has often raised problems such as bias, incomplete memory or behavior based on tacit knowledge.
- **Integration of many data sources.** While using Snapchat the main data sources are pictures and videos of personal behavior combined with annotations. These data are enriched with traditional sources like scientific publications, statistics or databases in preparing and running the face-to-face discussion between the different Delphi rounds to obtain consent and/or to find out theses with a strong dissent between the participants.
- **Increased importance of personal data.** The smartphone is the most personal device a Digital Native owns. D-Move Delphi is used to capture personal impressions of issues raised in the Delphi's theses. Proposed arguments and contributions during the face-to-face rounds can be assigned to a certain participant, which also highlights the known advantages and disadvantages of non-anonymous empirical research.

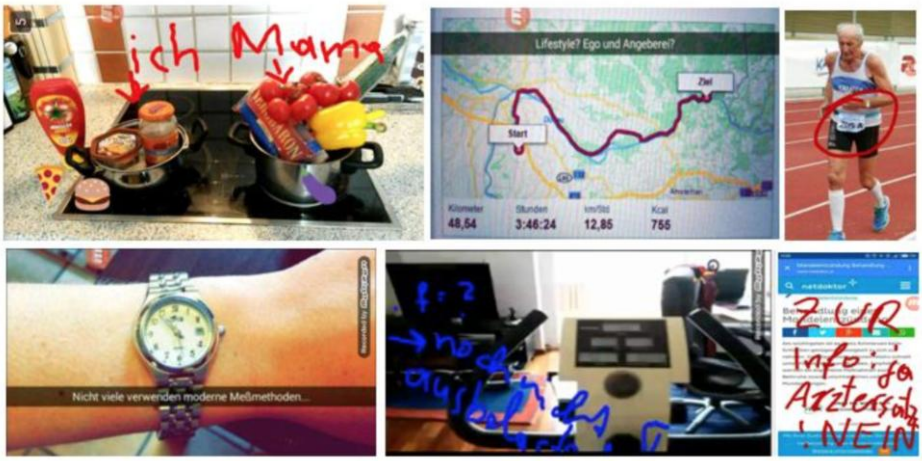

Figure 1. Example of contributions in the first round of D-Move Delphi to be discussed in the face-to-face meetings.

Figure 2 displays the Delphi method used to implement D-Move Delphi and gain insights into Digital Natives' attitude and behavior towards 'Self-monitoring in Health and Fitness'. First, the Delphi Method used was presented to the 24 participants of a master course in Information Systems. The technology-, social-, privacy- and business-related issues of self-monitoring as a major trend in information systems - based on the Internet of Things - were discussed. Examples of smartwatches and wristband sensors, wearable sensors and monitoring patches, brain-computer interfaces, neuro-sensing and emotion-mapping (Swan 2013) were presented together with relevant backend platforms like Strava, Nike+, and Runtastic. The main issue raised in the course and in the Delphi's theses was the impact of self-monitoring on business models, e.g. on the value proposition provided, attributes of goods and services and how they are produced as well as the revenue model.

In a pre-test the correct interpretation of the formulated thesis as well as the usability and stability of the D-Move Delphi application was tested by ten participants in their role as Delphi experts. After the refinement of the Delphi thesis and optimization of usability aspects, the first Delphi round was started with twelve Digital Natives as experts. They captured real world examples of using self-monitoring in health and fitness in the form of pictures and videos, annotated them and shared their findings using the functionalities of D-Move Delphi. Between the field periods the participants analyzed, presented, and discussed their results in face-to-face meetings to identify issues with high consent or dissent as a foundation for the next field round. In the first step, basic assumptions were discussed by the participants regarding their own behavior with the use of more open questions. Subsequently, results were aggregated to eight theses in the form of closed questions. In a second Delphi round, 17 Digital Natives captured more real world examples in their role as experts, annotated them in coherence with the presented thesis and shared them. In the face-to-face session that followed, the experts discussed topics with high amount of dissent to elaborate on its causes and to gain consent. The final step was the presentation of the Delphi results by each group and a written final report.

3. EXAMPLE RESULTS OF D-MOVE DELPHI FOR THE ISSUE OF SELF-MONITORING

This section puts forward some example results of the D-Move Delphi concerning the self-monitoring thesis. Two of the Delphi theses lead to the most homogeneous results. The first thesis posits that for Digital Natives health and fitness is a much more important part of their lifestyle than it was for their parent's generation (mode = 5 on a 5-point Likert scale, 5 meaning strong consent, standard deviation = 1.750). The second thesis claims that Digital Natives like to get immediate feedback by self-monitoring apps about their lifestyle and be rewarded for appropriate behavior much more than their parents' generation (mode = 5, standard deviation = 0.728). This consent corresponds to D-Move Delphi results using other front ends than Snapchat (Petrovic 2017), showing that Digital Natives believe that they use app-based fitness programs more than older generations and share the results more frequently than their parents. Digital Natives also believe the

trend of health & fitness to have gained importance across all generations, particularly in regards to awareness and personal responsibility for one's own health. Participants think that this is not a question of generations but much more of social stratum and education. Another important finding is that the authorities setting the standards differ greatly between Digital Natives and their parents' generation. Digital Natives adapt themselves more to their peers using social media and self-monitoring technologies, whereas their parents' generation is strongly oriented on standards set by traditional authorities like the World Health Organization. Those results from D-Move Delphi evidently show that there already exists an on-going social impact of self-monitoring in an important field like health and fitness. Thus, a main characteristic of a disruptive innovation (Christensen, C. 1995) can be identified.

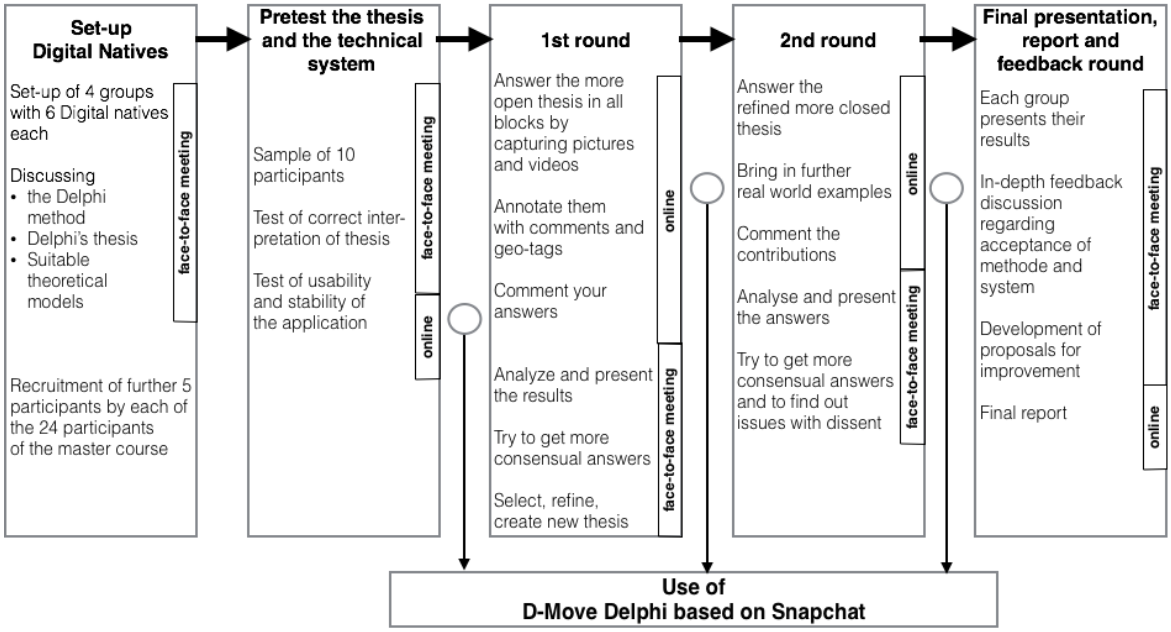

Figure 2. Method used by D-Move Delphi to gain insights into Digital Natives.

4. CONCLUSION AND NEXT RESEARCH STEPS

After finishing the D-Move Delphi using Snapchat as the front end, an in-depth group discussion with the participants identified starting points for improving the method and the software used. The results show that compared to Delphi methods based on traditional paper-based or online questionnaires the issues presented in Table 1 were addressed to a satisfying extent. Due to the visual presentation of questions and answers, the gamification aspect was supported and Snapchat as the used front end was perceived as fast and fuzzy. The feasibility of context oriented embedded research was experienced as a main advantage of D-Move Delphi. In particular, the implementation of different data sources including personal data can be viewed as an advantage of the method used. Simultaneously, privacy issues were heavily discussed, despite the fact that personal information is necessary to obtain high involvement and engagement.

The central finding is that the method used, as shown in Figure 2, is suitable for gaining insights into Digital Natives attitude and behavior, but Snapchat as the used front end was not. The participants described it as confusing, unfamiliar, and childish. They criticized the low perceived usability, the low dissemination among their peers, and the central characteristic of Snapchat, namely the disappearing of content after viewing. They stated that they would much more prefer WhatsApp and Facebook as the front end to D-Move.

We have learned that the term 'Digital Natives' is much too broad and that it ought to be divided into different subgroups, especially in regards to the communication tools used. While email is the main communication tool for Digital Immigrants, made up of people aged 35 and above, Facebook is familiar to both mature Digital Natives and Digital Immigrants. The participants of the Delphi stated that they prefer WhatsApp or partly Facebook – but not Snapchat. By looking at Snapchat's user base of more than 120 Million worldwide, it can be concluded that it mainly consists of people in the age group below the average age of master course participants.

In further research we will continue to refine the method and back end functionalities used in D-Move Delphi, but they will remain largely unchanged. Depending on the exact age group we will adapt the front end, using everything from traditional online questionnaires enriched with pictures and videos to Facebook, WhatsApp and Snapchat. The central challenge is to fulfill all requirements shown in Table 1 independently from the preferred front end of a group of Digital Natives to support embedded research and capture real world experiences. After this improvement D-Move Delphi will be used to gain insights into Digital Natives on a regular basis and can be further evaluated.

ACKNOWLEDGEMENT

This article is based on the results of the master thesis of Naida Hamzic, which was submitted to the author in 2016. Her valuable work is kindly acknowledged.

REFERENCES

Christensen, C. 1995. Disruptive Technologies Catching the Wave. Harvard Business Review, January– February p. 43-53.

Hagenhoff, W. 2015. Der und „Das" Befragte: Inwieweit findet Marktforschung künftig ohne Befragte statt?, in: Keller, B. et al.: Zukunft der Marktforschung. Wiesbaden: Springer Fachmedien.

Häder, M./Häder, S. 2000. Die Delphi-Technik in den Sozialwissenschaften. Methodische Forschungen und innovative Anwendungen. Wiesbaden: Westdeutscher Verlag.

Jones, C. 2011. The Net Generation and Digital Natives: Implications for Higher Education. The Open University, Walton Hall, Milton Keynes.

Lee, M. J. W./McLoughlin, C. 2010. Web 2.0-Based E-Learning: Applying Social Informatics for Tertiary Teaching. Hershey.

Linstone, H. A./Turoff, M. 1975. The Delphi method: Techniques and applications. Reading, Massachus- etts: Addison-Wesley Publishing Company.

Loë, R. C.et al. 2016. Advancing the State of Policy Delphi Practice: A Systematic Review Evaluating Methodological Evolution, Innovation, and Opportunities, in: Technological Forecasting and Social Change, vol. 104, p. 78-88.

Petrovic, O. 2016. Design, Development and Evaluation of a Field Learning Video Blog, in: Proceedings of the 12th International Conference on Mobile Learning, Vilamoura, Algarve, Portugal, p. 51-58.

Petrovic, O, 2017. Internet of Things as Disruptive Innovation for the Advertising Eco System, in: Commercial Communication, in print.

Swan, M. 2013. Sensor Mania! The Internet of Things, Wearable Computing, Objective Metrics, and the Quantified Self 2.0: Journal of Sensor and Actuator Networks, p. 217-253.

Tapscott, D./Williams, A. D. 2008. Wikinomics, How Mass Collaboration Changes Everything. New York.