

Applying lead user theory to young adults

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Abstract

Purpose – *The purpose of this paper is to identify lead users within social networks of young adults between 14 and 17 years of age.*

Design/methodology/approach – *A questionnaire and the SAGS-method were used to collect data within seven high schools in the north of The Netherlands. These data were used to empirically test five hypotheses using the variables which could enable the identification of lead users. A multiple regression analysis was used to test the predictive value of the variables. The analysis was complemented with a qualitative analysis of the collected data.*

Findings – *The main characteristics which identify lead users among adults can also be used with young adults. Those young adults who are more likely to be a lead user, are more ahead of a trend and have a higher amount of expected benefit. They also display more expertise than other young adults.*

Research limitations/implications – *The variable of perceived information benefits could complement the variables used for identifying lead users among young adults, but further research is necessary. Because the focus is on only one specific product, the generalizability of the results from this research is limited. Further research should include different products or services in different domains of interest. The variables of perceived information benefits and efficiency did not have a significant positive relation with lead userness, but further research is needed.*

Practical implications – *The identification of lead users could be valuable to organizations that focus on young adults in the age range 14 to 17 years and could lead to significant commercial benefits. Young adults are a large potential market and the identification of lead users within this target group could help organizations*

Originality/value – *Research on lead user theory is mainly focused on adults or organizations. This article tries to fill this research gap by focusing on young adults. It is an extension of the research of Kratzer and Lettl, Kunst and Kratzer and Molenmaker et al. who focused on children from 8 to 12 years old.*

Keywords *Young adults, Innovation, Social networks, Marketing strategy*

Paper type *Research paper*

Introduction

The development and sale of a new product or service is a challenging task for many organizations. Regular market research analysis to uncover the needs of the target market is not always sufficient. This also applies to innovations with a high technology label like multimedia products and services. The market of high technology products and services changes rapidly and so do consumer needs regarding this field (Subin and Workman, 2004; Von Hippel, 1986). Therefore, tools that help clarify these needs and which make the process of developing and diffusing the innovation more comprehensible are more than welcome. The lead user theory, first proposed by Von Hippel (1986), provides such a tool. This theory has significant empirical support for being a source of commercially attractive and innovative new product ideas (e.g. Franke and Shah, 2003; Franke *et al.*, 2006; Kratzer and

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Lettl, 2008; Lüthje *et al.*, 2002; Morrison *et al.*, 2000; Schreier and Prügl, 2008; Von Hippel, 1986).

An organization can employ users to provide the necessary information to develop commercially successful products or services. Two current examples of the application of users for providing ideas for new products, are the Dutch television program “Het beste idee van Nederland” (“The best idea of The Netherlands”) and the trend towards “crowdsourcing” (Tomesen, 2008). The program “Het beste idee van Nederland” lets people show their solutions to everyday problems with certain products. The term “crowdsourcing”, invented by Jeff Howe (Harkin, 2008), describes the outsourcing of the generation of new products or concepts to the crowd. In his opinion: “the crowd knows it better” (Tomesen, 2008).

But before an organization can implement lead users in their research and development process, these lead users will have to be identified. Which characteristics can be used to identify lead users? The goal of this research is to empirically test five variables derived from earlier studies and determine the nature of their possible relationship with the degree of lead userness a person displays. This research could therefore help to strengthen the systematic identification of lead users (e.g. Franke *et al.*, 2006; Schreier and Prügl, 2008; Von Hippel, 1986).

Research on lead users usually focuses on adults. This article will examine young adults from 14 to 17 years of age. They are part of the so-called Generation Y (NAS, 2006; Paul, 2001). This generation is a large potential market and young adults have an increasing commercial worth (Grant, 2004; Paul, 2001). They have the ability to spend a considerable amount of money and they also influence the buying pattern of their peers and parents (Grant and Waite, 2003; Zollo, 1995).

Furthermore, younger people tend to practice more novelty-seeking behavior (Manning *et al.*, 1995; Raju, 1980). In this stage of their lives they go through multiple changes, which leads to experimenting to get ready for adulthood (Grant and Waite, 2003). This experimenting can lead to the development of certain needs and ideas about solutions for certain problems, related to products or services. This is valuable data to a company (Lilien *et al.*, 2002; Von Hippel, 1986). Identifying the “right” young adults that possess lead user characteristics and building a relationship between the organization and the young adult target market is hard, because of the rapid changes young people go through (Grant, 2004). The application of lead user theory can possibly help overcome this problem with identification that many organizations face when targeting young adults.

This article is structured as follows: first the appropriate literature regarding lead user theory and social network theory is explored. This results in five hypotheses, displayed in a conceptual model. The paragraph on methodology explains the way the hypotheses are researched and tested. The results from this research are then described. The paper ends with a discussion of these results, practical implications for marketers and the limitations of the research.

Literature review

This article is built on two main theories: lead user theory and social network theory. The variables which will be researched are drawn from these theories.

Lead user theory

The economic success of an organization depends on their ability to recognize the needs of their customers and to create products or services that meet those needs for an as wide as possible appropriate customer base (Lüthje *et al.*, 2002; Ulrich and Eppinger, 2004). The identification of the needs of young adults from 14 to 17 years is difficult. Lead user theory can help with the identification of young adults who display lead user characteristics in a specific field and uncover their needs. The involvement of lead users can lead to

commercially attractive new products and services and has empirical support for achieving new product success (Franke *et al.*, 2006; Gruner and Homburg, 2000).

Research in the field of lead user theory is mainly focused on adults. Research with respect to the applicability of lead user theory to young adults is scarce. This raises the question how this theory applies to children and young adults. Kratzer and Lettl (2008), Kunst and Kratzer (2007) and Molenmaker *et al.* (2008) focused in their research on children from 8 to 12 years old. This article researches the identification of lead users within social networks of young adults from 14 to 17 years of age.

Why are lead users useful and which characteristics set them apart from “regular” users? For innovations such as for example new multimedia products or services, “regular” users often do not possess the right information and they are often constrained by “functional fixedness” (Von Hippel, 1986). Functional fixedness occurs when objects or problem-solving strategies that were previously used, are used again in another problem context. This constrains the user in finding solutions to the new problem (Adamson, 1952; Birch and Rabinowicz, 1951; Lilien *et al.*, 2002). It becomes even more difficult when the objects or problem-solving strategies are more recently used (Adamson and Taylor, 1954; Lilien *et al.*, 2002; Von Hippel, 1986). Lead users display characteristics that set them apart from “regular” users (Von Hippel, 1986). They do experience functional fixedness just as any regular user, but they are familiar with conditions that lie in the future for most other users. This makes lead users valuable to organizations, because they can provide accurate data on their needs (Von Hippel, 1986).

But what are the characteristics of a lead user? A lead user has two main characteristics (Von Hippel, 1986). First, they face needs that will become general in a marketplace, months or years earlier than most users in that marketplace. Second, they can benefit significantly by obtaining a solution to those needs (Franke *et al.*, 2006; Von Hippel, 1986). But these are not the only characteristics they display. Franke *et al.* (2006) tested the lead user theory empirically and found that the resources at hand for lead users have an important influence on the commercial attractiveness of an innovation. These resources at hand are separated in two characteristics: “technical expertise” and “community-based resources” (Franke *et al.*, 2006). Members of certain communities (groups of people sharing the same interest) do not come up with innovations alone, they receive assistance and information from other members of the community (Franke and Shah, 2003). The commercial attractiveness of an innovation benefits by these community-based resources (Franke *et al.*, 2006).

In this article the two main lead user characteristics “ahead of a trend” and “expected benefit” will be tested for their applicability to young adults, following the research of Franke *et al.* (2006), Schreier and Prüggl (2008) and Von Hippel (1986). Furthermore the variable “expertise” is included, because to accomplish modifications to an existing product a lead user has to have this ability (Franke *et al.*, 2006).

Lead userness. The degree of lead userness is a characteristic a person displays relative to a certain product or service (Von Hippel, 1986). A person can for example be a lead user in the field of kite surfing, but not with regards to mobile phones. Studies regarding different products can therefore render different results with regard to the people who display lead user characteristics (Schreier and Prüggl, 2008). Lead users who have a great interest in a certain field spend considerable time gaining experience of this specific field (Schreier and Prüggl, 2008; Von Hippel, 1986). Therefore, these lead users are in a position to encounter needs and solutions that become in general demand in the future for “regular” users (Schreier and Prüggl, 2008; Von Hippel, 1986). When lead users are implemented in the research and development process of an organization, they can collaborate with the organization to generate promising new product concepts (Gruner and Homburg, 2000; Lilien *et al.*, 2002; Schreier and Prüggl, 2008). Lead users are also a very valuable source for marketing research (Schreier and Prüggl, 2008).

Ahead of a trend. According to the diffusion theory of Rogers (1976), not all members of a social system adopt an innovation at the same time. As Schreier and Prüggl (2008, p. 333)

stated: "The rationale behind this idea is that market needs tend to evolve along the lines of underlying trends". Lead users are ahead of a trend: they face needs related to a certain problem, months or years earlier than the bulk of the market (Von Hippel, 1986). Being ahead of a trend can predict the likelihood that a user will actually innovate. It also predicts the commercial attractiveness of an innovation that is developed by a user (Franke *et al.*, 2006; Schreier and Prügl, 2008).

With respect to young adults, Raju (1980) stated that they display novelty-seeking behavior. This novelty-seeking behavior results in the search for information about new products or ideas (Manning *et al.*, 1995). This active acquiring of information about future solutions to certain needs can result in being ahead of a trend. Zollo (1995) also states that young adults are often trendsetters. Young adults who display more novelty-seeking behavior and who set trends are likely to be more ahead of a trend. In this research it is proposed that some young people are more ahead of a trend than other young adults. It is therefore hypothesized:

H1. The more ahead of a trend a young adult is, the more likely he or she can be identified as a lead user.

Expected benefit. The likelihood that a user will innovate also depends on the benefits that are expected for actually developing an innovation (Franke *et al.*, 2006) The higher the amount of benefit a user expects, the more motivated he or she will be to actually develop a solution to a certain problem (Von Hippel, 1986). This benefit can be either financial or non-financial. With kite surfing for example, the user invention of straps to the board prevents the kite surfer from hurting himself when performing jumps (Franke *et al.*, 2006). In this case the lead user personally benefited by adjusting certain aspects of an existing product (Franke and Shah, 2003; Lüthje *et al.*, 2002).

Young adults from Generation Y are being raised in an ever changing multimedia environment, in which diverse information comes to them at high speed (Grant and Waite, 2003; Grant, 2004; NAS, 2006). Young adults do want to be engaged, but on their own terms and in their own way (Bakker, 2005; Grant, 2004). They use media in different ways and use more "new media" like the internet and mobile phones (Bakker, 2005). This specific use of new media can create certain needs which young adults want to satisfy. It is presumed that young adults who expect more benefit compared to other young adults from satisfying these needs, can more likely be identified as a lead user. Hypothesis two is therefore defined as:

H2. The higher the amount of expected benefit a young adult expects, the more likely he or she can be identified as a lead user.

Expertise. Users who are likely to innovate tend to use information that is already familiar to them or that exists in their domain of interest (Lüthje *et al.*, 2002). Mitchell and Dacin (1996) found that experts have more product-domain knowledge than novices do. Being able to accomplish modifications to existing products or services or the invention of solutions for certain problems, requires a certain level of expertise (Franke *et al.*, 2006). Having a certain level of expertise has a positive impact on the likelihood a user will innovate (Franke *et al.*, 2006).

Because they are being raised in the age of technology, young adults are very comfortable with new technology, being early adopters of new media (Grant and Waite, 2003; NAS, 2006). When looking for information, they have a choice of multiple sources which they can reach instantly through for example the internet (NAS, 2006). A technological phenomenon that is part of many young people's lives is online social networking (Williams and Merten, 2008). For example, in the USA in 2007, 55 percent of all teens were engaged in an online social network (Lenhart and Madden, 2007). Online social networking is also a trend in The Netherlands. In September 2008, the research company Syndicate announced that The Netherlands has the most online social network members compared to other countries. Young adults spend a lot of their free time engaging in these online social networks and are therefore often experts in this field (Bakker, 2005). In this article it is proposed that some

young adults have more expertise in a specific domain than other young adults and can therefore be more likely identified as a lead user. Hypothesis three is defined as:

- H3.* The more expertise a young adult has in a specific domain, the more likely he or she can be identified as a lead user.

Social network theory

The implementation of lead users in the development phase can lead to innovative new products which in turn can lead to more product success (Gruner and Homburg, 2000; Franke *et al.*, 2006). To creatively form a new idea, these lead users have to acquire and combine information from different sources (Burt, 2004; Kratzer and Lettl, 2008). Research has shown that information flowing within social groups is more homogenous than between groups (Burt, 2004). Therefore, the position (and the subsequent relationships) a person has within a social network is an important factor for the amount, speed and diversity of information a person has access to (Burt, 1992). The direct and indirect linkages a person has with others in the social network can offer information benefits in the form of social capital (Adler and Kwon, 2002; Burt, 1992). This social capital can give a person the advantage of gathering valuable information from others in the social network (Adler and Kwon, 2002).

From social network theory, the following variables will be empirically tested: efficiency and perceived information benefits.

Efficiency. With his theory of structural holes, Burt (1992) explains which members in a social network are likely to have access to more diverse information sources at a higher speed. A structural hole lies between two contacts in a social network that are nonredundant. Nonredundancy means that these contacts lead to different people in the network and therefore lead to different sources of information. People with a high degree of efficiency, who have an optimized network with a maximized number of nonredundant contacts, have access to more diverse information sources (Burt, 1992; Burt, 2004).

Innovators use the links they have in their communities and implement the information and assistance they receive from members in that community (Franke and Shah, 2003). These community-based resources have a positive influence on the likelihood that a user will innovate and also contributes to the commercial attractiveness of the innovation (Franke *et al.*, 2006). People who stand near a structural hole in a social network are more likely to have a good idea for an innovation (Burt, 2004).

Kunst and Kratzer (2007) researched the position of lead users among social networks of young children (8 to 12 years old) and found that lead users have a higher amount of weak ties. Information which is passed through weak ties reaches more people and travels a greater social distance (Granovetter, 1973). Weak ties bridge structural holes (Burt, 1992). To measure which young adults have an optimized network with a maximized number of nonredundant contacts, efficiency is a suitable indicator. In this article it will be researched if lead users among young adults in the age of 14 to 17 years old display a higher degree of efficiency. It is therefore hypothesized that:

- H4.* The higher the efficiency of a young adult in his or her social network, the more likely he or she can be identified as a lead user.

Perceived information benefits. Efficiency is an index which measures the amount of information benefits a person can profit from related to his or her position within a social network. The higher the efficiency, the more information benefits a person can utilize (Burt, 1992). Quantifying the actual information benefits a young adult can take advantage of is difficult. The measurement of efficiency gives an indication how likely it is that a person can benefit from a certain position in a social network. But this does not indicate if they actually experience information benefits.

There are three forms of information benefits: access, timing and referrals (Burt, 1992). Access refers to receiving valuable information and knowing who in the social network can

use it. Receiving important information is important, but by receiving this information earlier than others a person can benefit more. Burt (1992) defines this as timing. A person has a limited amount of time and cannot be present everywhere. Referrals occur when other persons in the network are informed about you. This provides possibilities to the person who is referred (Burt, 1992).

To form a good idea to satisfy a certain need, lead users need diverse sources of information (Burt, 2004; Kratzer and Lettl, 2008). They need to have access to valuable pieces of information, get this valuable information early and from points in a network that are at a greater social distance (Adler and Kwon, 2002; Burt, 1992). It is interesting to see if a young adult who is perceived to have more information benefits, can more likely be identified as a lead user. It is therefore hypothesized that:

- H5.* The higher the amount of perceived information benefits a young adult has, the more likely he or she can be identified as a lead user.

Conceptual model

The five hypotheses lead to the conceptual model shown in Figure 1.

Methodology

Procedure

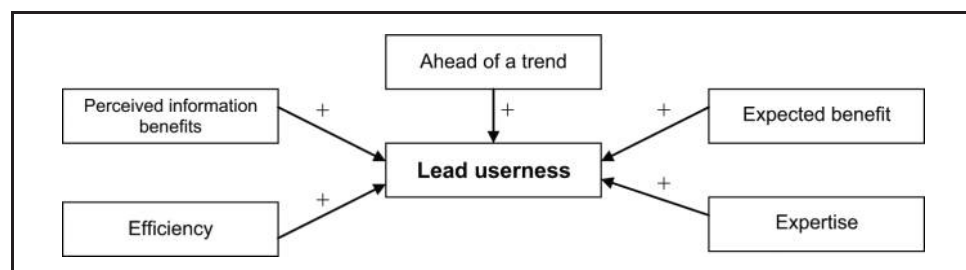
The data to test the hypotheses empirically was gathered from high schools in the north of The Netherlands, including the regions Drenthe, Groningen and Friesland. A website called "Schoolzoeker.nl" was the main source used to locate the high schools (www.schoolzoeker.nl). A list of 84 schools was constructed and each school was contacted by e-mail and phone. The construction of the list was nonrandom, but an attempt was made to include as many high schools from the north of The Netherlands as possible. Not all schools were up to date with their contact information, so these schools were not included. Seven schools positively responded to the request to participate.

School classes have characteristics that make them very suitable to collect data for social network analysis. First, the boundaries of a class are defined and are known *a priori*, allowing for a full network analysis (Hanneman and Riddle, 2005). A full network analysis is necessary for the measurement of efficiency. Second, by using several classes, it is possible to replicate populations and subsequently test the hypotheses (Hanneman and Riddle, 2005). A population that is studied through network analysis is defined as falling within certain boundaries. School classes are defined as naturally occurring networks in which the members constitute the boundaries (Hanneman and Riddle, 2005).

Sample

The sample contained 11 classes from seven high schools. In The Netherlands high schools are divided into four different school types. This research included three levels of education (in increasing order): "VMBO-TL", "HAVO" and "VWO". There were 168 young adults from "VMBO-TL", 45 from "HAVO" and 45 from "VWO". The ages of the young adults ranged

Figure 1 Conceptual model



from 14 up to and including 17 years. The average age was 15,37 years. The total sample consisted of 258 young adults. The average size of a class was around 23 pupils. There were slightly more girls (50.4 percent) than boys (45.7 percent) in the sample. The response rate was fairly high at 79.5 percent.

Data collection

To gather the appropriate data to test the five hypotheses, the research was divided into two parts. A questionnaire was designed to test the variables “ahead of a trend”, “expected benefit”, “expertise” and “perceived information benefits”. For the construction of the social networks to measure the variable “efficiency”, the SAGS-method (Syracuse-Amsterdam-Groningen Sociometric Scale) was used (Defares *et al.*, 1971). SAGS is a method to objectively record the sociometric structure of a specific group. This particular scale was derived from the original American version and simplified by using a 1-to-5 Likert-type scale (cited in Defares). This makes this method applicable to all age groups from approximately nine years old and all levels of education (cited in Defares).

For the testing of the hypotheses a suitable research topic for the questionnaire was needed. The majority of young adults had to follow the dominant market trends regarding this topic and individual young adults had to be able to report about their leading-edge status relative to other young adults (Schreier *et al.*, 2007). For this purpose, the online social network “Hyves” (www.hyves.nl) was very suitable. This is supported by the data derived from the questionnaire: 80.6 percent of the young adults totally agreed with the statement “I know the website Hyves” and 13.9 percent agreed, adding up to a total of 94.5 percent.

Hyves is an online social network website which is very popular in The Netherlands. According to the calculations of STIR, the reach percentage of Hyves is 80.5 percent in the category 13 to 34 years old (Stichting Internet Reclame, 2009). The reach percentage of boys versus girls does not differ that much: 55.6 percent boys against 58.4 percent girls. Young adults can use Hyves in a regular way, but they can also be more innovative. They can change the layout of their profile page or place new gadgets on their page. Furthermore, Hyves gives them the opportunity to develop open social applications and introduce them to other Hyves-users as “gadgets”. These applications can have numerous different purposes; it can for example be an extension to an existing website ([www.hyves.nl/?module = GadgetGallery&action = showApplicationInfo](http://www.hyves.nl/?module=GadgetGallery&action=showApplicationInfo)).

All the data were collected on location at the schools. The researcher was present during the administering of the questionnaire and also performed the instructions in front of the class for the SAGS-method. This ensured the completion of both parts from all young adults present, thus achieving a high response rate. The young adults were first asked to fill in the questionnaire. The questionnaire contained 28 statements and took about 10 to 15 minutes to complete. Because of the difference in age and level of education between the young adults in the sample, the questionnaire was kept as clear as possible. Furthermore, it was intentionally kept short to keep the young adults interested and motivated to participate actively with the completion of part two of the research: the SAGS-method (Borgers, 2003).

After collecting all the completed questionnaires, the forms for the SAGS-method were handed out. Every pupil had to indicate per classmate how willingly they were to talk to this classmate when feeling sad or disappointed. With the result of the SAGS-method, a sociogram of each class could be constructed, indicating the friendship structures within each group (Defares *et al.*, 1971). The completion of both parts took about 45 minutes for an average class of 23 pupils.

Operationalization of the variables

The five variables were measured in two ways: through the questionnaire and by performing the SAGS-method.

Lead userness

To measure the degree of lead userness a six-item scale was used. All six items were derived from earlier studies and correspond to the scale Kratzer and Lettl (2008) and Molenmaker *et al.* (2008) used in their research among children from 8 to 12 years old. The statements are based on the two lead user characteristics from Von Hippel (1986) and an indicator about the dissatisfaction of a user with current market offerings based on Lüthje and Herstatt (2004). All items were measured on a 1-to-5 Likert-type scale, ranging from “always” to “never”. The scale for lead userness can be found in the Appendix. Cronbach's alpha was 0.65, and we consequently combined the six items into a single measurement of lead userness.

Ahead of a trend

The characteristic “ahead of a trend” is measured by a three-item scale. These three items are derived from multiple articles which defined lead user characteristics; Franke and Shah (2003), Schreier and Prügl (2008) and Von Hippel (1986). To keep the total number of statements in the questionnaire short, the indicators from these articles were combined into the three items displayed in the Appendix. All items were measured on an 1-to-5 Likert-type scale, ranging from “I totally agree” to “I totally disagree”. The internal consistency had a Cronbach's alpha of 0.74. We therefore combined the three items into a single measurement of the characteristic “ahead of a trend”.

Expected benefit

For the construction of the scale for measuring expected benefit, a seven-item scale was derived from the study of Franke *et al.* (2006). The statements were adjusted to fit the world of young adults and the subject of the questionnaire. Cronbach's alpha of the original seven-item scale was 0.69. After deleting one item, Cronbach's alpha was 0.73, and the remaining six items were combined into a single measurement of expected benefit. The scale is described in the Appendix. The answers to the items ranged from “I totally agree” to “I totally disagree”.

Expertise

We referred to Mitchell and Dacin (1996) to obtain a measure of expertise. The scale that Mitchell and Dacin (1996) constructed contained four measures that were used in the consumer behavior literature completed with specific questions about the knowledge related to the topic under scrutiny. The characteristic expertise is measured through self-report measures of knowledge. The items from Mitchell and Dacin (1996) were transformed from a seven-point scale to a 1-to-5 Likert-type scale and were adjusted to fit the world of young adults and the subject of the questionnaire. The items were divided in two parts on the questionnaire; the first four statements are translations of the four measures from consumer behavior literature and the second four statements specifically asked the young adult to score their knowledge of Hyves. All items can be found in the Appendix. The answers to the first four statements ranged from “I totally agree” to “I totally disagree”. The answers to the last four statements ranged from “always” to “never”. Cronbach's alpha was 0.88, and the eight items were combined into a single measurement of expertise.

Perceived information benefits

There was no existing scale for the measurement of perceived information benefits and we constructed a scale using the theory of Burt (1992). According to Burt (1992) there are three forms of information benefits: access, timing and referral. These three forms were translated into four scale items, shown in the Appendix. Items one and three relate to “access”, item two to “timing” and item four to “referral”. All items are measured on a 1-5 Likert-type scale, with answers ranging from “I totally agree” to “I totally disagree”. By giving answers to these statements the young adults provided information using self-report about the information benefits they perceived. Cronbach's alpha was 0.65 and the four items were combined into a single measurement of perceived information benefits.

Efficiency

Data to measure the variable efficiency were gathered by using the SAGS-method. This resulted in one matrix per school class with a total of 11 matrices (Defares *et al.*, 1971). Matrices are especially suited for the manipulation of network data and calculation of indexes describing networks (Hanneman and Riddle, 2005). The young adults had to rate all their classmates on a scale from 1 to 5, on which a score of "1" or "2" means that he or she would never talk to a certain class mate and the scores "3" to "5" indicate an increasing intent to talk with a certain class mate. For the purpose of this research only the scores 3-5 were taken into account, because these scores indicate a certain level of friendship (Defares *et al.*, 1971). Moreover, the topic of this research was not so sensitive to require that only positive friendship relations were included. Acquaintances (indicated with a score of "3") could also be included.

To prepare the data for the calculation of the efficiency index a few steps were taken. First, all matrices were recoded into binary data, whereby the scores "1" and "2" were recoded to "0" indicating no relationship and the scores "3" to "5" were recoded to "1", indicating a relationship. It is normal practice in sociological research to calculate measures related to for example structural holes using binary data (Hanneman and Riddle, 2005). Second, all matrices were transposed and symmetrized. By transposing the matrices, the rows and columns are interchanged. Because this research is only concerned with connections and not the direction of ties, symmetrizing was appropriate.

The calculation of the efficiency index was executed with software for social network analysis: Ucinet VI (Borgatti *et al.*, 2002). By calculating the efficiency the amount of impact a person is getting for each invested unit in using ties can be determined. Efficiency shows what proportion of all ties of a person to its neighborhood are non-redundant (Hanneman and Riddle, 2005).

Control variables

Many variables could have an effect on the lead user status of a young adult. It is impossible to include all these variables, so it was decided to control for three variables that are commonly used in research related to young adults and children: age, gender and level of education. Young adults in the age of 14 to 17 years old are still developing their cognitive skills (Borgers, 2003). In this stage of their lives they go through multiple changes to get ready for adulthood (Grant and Waite, 2003). Their taste is also developing and therefore their needs related to products or services can change. This could affect the amount of lead user status they display. Age was therefore included as a control variable.

Boys and girls differ in their interests for certain products or services and this may also be true for multimedia products, like Hyves (Zollo, 1995). The way they use online social networks also differs (Lenhart and Madden, 2007; Williams and Merten, 2008). To control for these differences, gender was included as a dummy variable with boys coded as 0 and girls coded as 1.

It is also possible that the level of education influences the interests of a young adult with regards to the subject of the questionnaire. It is researched that the reach of Hyves differs with regards to level of education (Stichting Internet Reclame, 2009). This could affect the results of this research. Therefore, level of education was included as a dummy variable. VMBO-TL was used as the reference group coded as 0-0, HAVO was coded as 1-0 and VWO was coded as 0-1.

Results

Before analyzing the relationships between the five independent variables and the dependent variable lead user status, it is interesting to take a more qualitative look at the data provided by this research.

Qualitative analysis

There is no single right way to determine the score a “real” lead user should obtain on the scale used in this research. In an ideal world, a lead user would score between 24 or 30 on this scale. But no young adult in this research achieved this score. This could be due to the response bias known as “central tendency” that is known to occur with rating scales like the Likert scale used in this research. The young adults could have been reluctant to give extreme judgments: scores of only 4 or 5 (Cooper and Schindler, 2003). For the purposes of the qualitative analysis a cut-off point of 19 was chosen. With a score of 19 a young adult has chosen “often” (which means a score of 4) or “always” (which means a score of 5) when answering the lead user statements. This is an indication this particular young adult has a certain degree of lead userness. The data on lead userness could be compared on different levels: the total group of respondents, boys v. girls, age and per school class and level of education. All data is summarized in Table I.

Looking at the total group of respondents, there are four young adults who have scores of 19 or higher. The highest score obtained was 21. Only 2 percent of all respondents show some degree of lead userness. The proportion of lead users when comparing boys and girls is 3:1. There seems to be no real difference in lead userness between level of education: each level contains a lead user. Because of the small amount of lead users, not every school class contains a young adult with a certain degree of lead userness.

Multiple regression analysis

For the testing of the five hypotheses a multiple regression analysis was conducted, where lead userness was the dependent variable and the five characteristics were the independent variables. To draw conclusions about a population from a regression analysis, certain assumptions have to be met (Field, 2005). The VIF (Variable Inflation Factor) and CI (Condition Index) were checked and the multicollinearity assumption was not violated. A Durbin-Watson index of 2.04 indicated that the errors are independent.

Before displaying the results of the multiple regression analysis, the results of a Pearson's correlation analysis are shown. This analysis measures if there is a linear relationship between the variables (Field, 2005). All descriptives and correlation coefficients are displayed in Table II.

Table I Descriptives lead userness

	<i>n</i> ^a	<i>Mean LU score</i>	<i>Min. score</i>	<i>Max. score</i>	<i>SD</i>	<i>No. LUs</i>	<i>% LU total</i>
Total sample	197	9.77	6	21	3.09	4	2
Boys	92	9.77	6	21	3.44	3	3.3
Girls	105	9.77	6	19	2.76	1	1.0
Age = 14	25	10.92	6	20	3.00	1	4.0
Age = 15	91	9.54	6	16	2.54	0	0
Age = 16	62	9.77	6	21	3.60	2	3.2
Age = 17	18	9.11	6	19	3.63	1	5.6
School class A: HAVO	22	10.68	6	21	3.48	1	4.5
School class B: VWO	21	10.10	6	19	3.51	1	4.8
School class C: VMBO-TL	18	9.83	7	15	2.90	0	0
School class D: HAVO	16	9.69	6	16	2.77	0	0
School class E: VMBO-TL	19	11.05	6	20	3.24	1	5.3
School class F: VMBO-TL	19	7.74	6	16	2.64	0	0
School class G: VMBO-TL	15	8.87	6	14	2.29	0	0
School class H: VMBO-TL	15	11.07	6	19	2.87	1	6.7
School class I: VMBO-TL	21	9.29	6	14	2.99	0	0
School class J: VMBO-TL	17	9.41	6	16	2.85	0	0
School class K: VWO	14	9.64	6	16	3.13	0	0

Notes: ^aExcluding missing scores

Table II Descriptives and correlation coefficients

Variables	Mean	SD	2	3	4	5	6	7	8	9	10
1. Lead userness	9.77	3.09	-0.10	0.00	0.08	0.02	0.52**	0.34**	0.43**	0.04	0.42**
2. Age	15.34	0.85	-	-0.17**	-0.29**	0.29**	-0.05	0.09	-0.06	0.05	-0.10
3. Gender	0.58	0.50	-	-	0.07	-0.03	0.15*	0.09	0.32**	-0.14*	-0.09
4. VMBO-TL v. HAVO	.2296	0.42	-	-	-	-0.21**	0.05	0.06	0.09	-0.21**	-0.03
5. VMBO-TL v. VWO	0.1852	0.39	-	-	-	-	0.12*	0.08	0.00	-0.09	0.04
6. Ahead of a trend	6.43	2.47	-	-	-	-	-	0.37**	0.65**	0.08	0.40**
7. Expected benefit	14.80	4.73	-	-	-	-	-	-	0.24**	0.01	0.33**
8. Expertise	24.99	6.30	-	-	-	-	-	-	-	0.09	0.27**
9. Efficiency	0.58	0.25	-	-	-	-	-	-	-	-	-0.03
10. Perceived information benefits	10.75	2.87	-	-	-	-	-	-	-	-	-

Notes: *Correlation significant at the 0.05 level (one-tailed); **correlation significant at the 0.01 level (one-tailed)

There was a significant positive relationship between ahead of a trend and the degree of lead usersness of a young adult, $r = 0.52$. Expected benefit also has a positive relationship with lead usersness with a coefficient of $r = 0.34$. The amount of expertise and the perceived information benefits of a young adult both had a significant positive relationship with the degree of lead usersness, with coefficients of respectively $r = 0.43$ and $r = 0.42$. All correlations are significant at the 0.01 level and are one-tailed. Only the social network measurement efficiency has no significant correlation with the degree of lead usersness. This means that the degree of lead usersness remained the same, regardless of the level of efficiency a young adult had.

The gender of a young adult was significantly correlated with ahead of a trend ($r = 0.15$, $p < 0.05$, one-tailed), the amount of expertise ($r = 0.32$, $p < 0.01$, one-tailed) and the amount of efficiency ($r = -0.14$, $p < 0.01$, one-tailed). The first two coefficients are positive, implying that girls are more ahead of a trend and have more expertise than boys. Gender has a negative significant correlation with efficiency, indicating that boys have a higher amount of efficiency in the social network.

The level of education VMBO-TL v. HAVO correlates significant with the amount of efficiency, although this correlation is moderate ($r = -0.21$, $p < 0.01$, one-tailed). This indicates that young adults who study at the HAVO-level scored lower on the amount of efficiency than young adults who study at the VMBO-TL-level. For the variable ahead of a trend, the opposite is true for VMBO-TL v. VWO. With a positive significant correlation ($r = 0.12$, $p < 0.05$, one-tailed), there is an indication that young adults who study at the VWO-level scored higher on being ahead of a trend than young adults who study at the VMBO-TL-level.

Looking at the variable ahead of a trend, there is a positive significant relationship with expected benefit ($r = 0.37$, $p < 0.01$, one-tailed), expertise ($r = 0.65$, $p < 0.01$, one-tailed) and perceived information benefits ($r = 0.40$, $p < 0.01$, one-tailed). This indicates that the more ahead of a trend a young adult is, the more expertise, the higher the amount of expected benefit and the more perceived information benefits he or she has. The variable expected benefit correlates significantly positive with expertise ($r = 0.24$, $p < 0.01$, one-tailed) and perceived information benefits ($r = 0.33$, $p < 0.01$, one-tailed). So the more expected benefit, the more expertise and the more perceived information benefits a young adult has. Lastly, there is a positive significant relationship between expertise and perceived information benefits ($r = 0.27$, $p < 0.01$, one-tailed). This implies the more expertise a young adult has, the more perceived information benefits he or she has. Although some of the variables correlate with one another, the multicollinearity assumption in the multiple regression analysis was not violated.

In order to test the predictive value of the variables on the degree of lead usersness, a multiple regression analysis was performed. The variables were all forced into the model simultaneously using the forced entry method (Field, 2005). The theoretical background gave no reasons to enter the variables in a particular order. The regression model is displayed in Table III.

Table III shows that the control variables age, gender and level of education have no significant relationship with lead usersness. The variable ahead of a trend has a positive relationship with lead usersness and this relationship is significant ($p < 0.01$). This result supports $H1$: the more ahead of a trend a young adult is, the more likely he or she can be identified as a lead user. Ahead of a trend is the most important predictor in the model, with a beta of .33, considering that all other predictors are held constant (Field, 2005). It affects the outcome in lead usersness with a coefficient of $B = 0.38$.

Expected benefit also has a significant positive relationship with lead usersness. This result leads to an acceptance of $H2$: the higher the amount of expected benefit a young adult has, the more likely he or she can be identified as a lead user. Expected benefit has a coefficient of $B = 0.10$ and a beta of 0.16. These are significant at the 0.05 level. Expected benefit is the least important predictor in the model.

Table III Multiple regression model including control variables

Variables	B	SEB	β	
Constant	8.02*	3.99	–	
Age	–0.33	0.25	–0.09	
Gender	–0.55	0.40	–0.10	
VMBO-TL v. HAVO	0.20	0.50	0.03	
VMBO-TL v. VWO	–0.17	0.49	–0.02	
Ahead of a trend	0.38**	0.10	0.33**	
Expected benefit	0.10*	0.04	0.16*	
Expertise	0.08*	0.04	0.17*	
Efficiency	–0.62	0.71	–0.06	
Perceived information benefits	0.13	0.07	0.13	
R^2				0.36**
Adjusted R^2				0.32**

Notes: * $p < 0.05$; ** $p < 0.01$

Expertise has a positive relationship with lead usersness and this relationship is significant, supporting *H3*. With a coefficient of $B = 0.08$ and a beta of 0.17, expertise is the second most important predictor in this model. Accepting *H3* means that the more expertise a young adult has in a specific domain of interest, the more likely he or she can be identified as a lead user.

The results displayed in Table III show that there is no significant relationship between efficiency and lead usersness, so *H4* is rejected. There is also no significant relationship between perceived information benefits and lead usersness, which leads to the rejection of *H5*. This research has therefore not proven that the higher the efficiency of a young adult or the more information benefits they perceive, the more likely they can be identified as a lead user.

Combining the variables ahead of a trend, expected benefit and expertise explains 36 percent of the variance in the degree of lead usersness a young adult displays.

Taking the descriptives from Table II into account, these did indicate that there was a significant correlation between perceived information benefits and lead usersness. Therefore, a second multiple regression model was constructed without the control variables to check the relationships when they are not controlled for. The results of this analysis can be found in Table IV. When not controlled for age, gender or level of education, perceived information benefits has a significant positive relationship with lead usersness. When the control variables are being entered into the analysis this effect disappears, although the descriptives in Table II show no correlation between perceived information benefits and the control variables.

Table IV Multiple regression model excluding control variables

Variables	B	SEB	β	
Constant	2.69**	1.02	–	
Ahead of a trend	0.39**	0.10	0.33**	
Expected benefit	0.09*	0.04	0.14*	
Expertise	0.07	0.04	0.14	
Efficiency	–0.52	0.69	–0.05	
Perceived information benefits	0.17*	0.07	0.16*	
R^2				0.35**
Adjusted R^2				0.33**

Notes: * $p < 0.05$; ** $p < 0.01$

Discussion of the results and conclusion

The aim of this research was to test five variables that could help with the identification of lead users among young adults from 14 to 17 years old. The results from this research made clear that the two main characteristics lead users display, ahead of a trend and expected benefit, are also applicable to young adults. Young adults, who are more ahead of a trend and have a higher amount of expected benefit, can more likely be identified as a lead user. Furthermore, the amount of expertise they have in a specific domain of interest can also predict the likelihood a young adult can be identified as a lead user.

From the qualitative analysis it became clear that the percentage of lead users found in this research was very small. Finding such a small percentage of lead users is common. Schreier and Prügl (2008) for example, referred to lead users as a "rare species". This scarcity stresses the importance of a reliable identification tool. This also shows the importance of a large enough sample relating to a specific domain of interest when searching for young adults who display a certain degree of lead useriness.

The qualitative analysis also revealed that three boys showed a certain degree of lead useriness against one girl. Although the multiple regression analysis did not reveal a significant relationship between gender and lead useriness, Molenmaker *et al.* (2008) also found that more boys were a lead user than girls. According to the figures of STIR (Stichting Internet Reclame, 2009) the reach percentage of Hyves does not differ that much between boys and girls, but it is possible that boys use Hyves in a different way. Lenhart and Madden (2007) and Williams and Merten (2008) indicated these gender differences with respect to the use of online social networks. This could be due to gender differences regarding friendship: girls have a higher quality of friendship and attach more importance to this quality (Flynn and Felmler, 2007). This could affect the use of Hyves: Hyves is a website where young adults construct an online social network of people they call "Hyves-friends". Girls may use Hyves more for friendship purposes than boys do.

Two variables did not have a significant relationship with the degree of lead useriness: the social network index efficiency and the variable perceived information benefits. It was hypothesized that a young adult, who had a higher degree of efficiency, would more likely be identified as a lead user. Molenmaker *et al.* (2008) found this to be true for children from 8 to 12 years of age. In this research no significant relation was found. Being more efficient, means having more non-redundant contacts. Young adults go through multiple changes in this stage of their lives to get ready for adulthood (Grant and Waite, 2003). They begin to rely less on their parents for their social needs than children and focus more on their friends (Furman and Buhrmester, 1992). Group acceptance is important (Parker and Asher, 1993). This could lead to the formation of close knitted groups with a high degree of redundant contacts, therefore diminishing the efficiency of the young adults.

The variable perceived information benefits also did not have a significant relation with lead useriness in the main regression model. When the control variables were excluded from the model, a positive significant relationship was found. The Pearson correlation coefficients also indicated a significant linear relationship with lead useriness. This does imply that a young adult who is perceived to have more information benefits regarding access, timing and referrals, could possibly be more likely identified as a lead user. This variable, which is new to lead user theory, could therefore complement the identification process. But no definite statements can be made, because the results do not provide an unambiguous picture.

The findings of this research are an important contribution to lead user theory. Lead user theory is mainly focused on adults or companies (e.g. Franke and Shah, 2003; Franke *et al.*, 2006; Lilien *et al.*, 2002; Schreier and Prügl, 2008; Von Hippel, 1986). The research of Kratzer and Lettl (2008), Kunst and Kratzer (2007) and Molenmaker *et al.* (2008) focused on children from eight to 12 years old. By researching the applicability of lead user theory to young adults, a start is made to fill a gap in lead user research. Furthermore, by empirically testing the main characteristics lead users display, the systematic identification of lead users could be strengthened.

This research also has managerial implications. The results are valuable for organizations that produce products or services for the target group of young adults. The implementation of lead user theory can have multiple advantages for organizations, because lead users can be employed in three different phases of the product life cycle. First, they can be implemented in the concept development phase (e.g. Franke and Shah, 2003; Franke *et al.*, 2006; Gruner and Homburg, 2000; Lilien *et al.*, 2002; Lüthje *et al.*, 2002; Von Hippel, 1986). Second, they can influence early adopters (Schreier and Prüggl, 2008) and last, lead users can act as a catalyst for the diffusion of innovations (Fisher and Price, 1992; Franke and Shah, 2003; Morrison *et al.*, 2000; Schreier *et al.*, 2007). An organization which for example implemented lead users into their product development process is 3M (Von Hippel *et al.*, 1999). And with success: the implementation of these users can lead to commercially attractive products or services (Franke *et al.*, 2006). Lilien *et al.* (2002) also concluded that the implementation of lead users can lead to ideas with more commercial potential than other methods.

A valid and reliable tool for identifying lead users in a specific domain of interest is therefore valuable to organizations. The results from this research can be implemented to find lead users among young adults. First, a specific domain of interest has to be chosen. In this specific domain of interest the organization could look for young adults who are active and who share information with others. This is an indication of a certain degree of expertise. An organization could ask these young adults to fill in a questionnaire with the scales used in this research, adapted to the specific domain of interest. Young adults whose scores indicate a certain degree of lead userness could then be found. Experts in certain fields do not operate alone, but they share knowledge with other experts (Franke and Shah, 2003; Lüthje *et al.*, 2002). They could indicate which other young adults are also active in the specific field, which could lead to the identification of more lead users.

When it is unclear which young adults are active in a certain domain of interest, an organization could execute a more academic method of identifying lead users by defining the population and drawing a sample. From the results it is clear that it is important to draw a large enough sample, because lead users are a "scarce species". When a sufficient sample is drawn, the organization could ask the selected young adults to fill in a questionnaire. Young adults who show a certain degree of lead userness could consequently be employed for the retrieval of valuable information about needs and preferences which become general to the bulk of the market months or years later. This improves the chances for an organization to be early with a commercially attractive product or service.

Limitations and suggestions for further research

Although the study was designed carefully, it does have its limitations. Because a non-random sampling method was used when constructing the sample, the findings cannot be generalized. Furthermore, this research focused on one particular product: Hyves and this also limits the generalization of the findings. Future research should therefore be executed with a variety of products and services in different domains of interest.

The variable perceived information benefits was introduced in this research. The results regarding this variable were not clear, but did indicate a possible relationship. Therefore, more research is necessary to define a possible relationship with lead userness and improve the measurement scale. Furthermore, no significant relationship between lead userness and efficiency was found. The research of Molenmaker *et al.* (2008) did indicate that a possible relationship could be found. Further research into the specific social structures young adults live in and the influence of these structures on the efficiency and lead userness could shed more light on this issue. Because of the rapid life stage changes young adults go through, it would also be interesting to do a longitudinal study to test if there are significant changes in the amount of lead userness.

Young adults in the age of 14 up to and including 17 years are under-age. The implementation of these young adults in the product and development process of commercial organizations could raise ethical objections from parents. When the data is

collected at high schools, following this research, schools could also have objections. It is therefore necessary to carefully construct the way data is collected from this target group and to always ensure the privacy of young adults involved.

Lastly, it is recommended that more research is done with regard to lead users and the variables which could lead to a higher likelihood of identification. In this research only 36 percent of the variance in lead users is explained by the variables ahead of a trend, expected benefit and expertise. Research including other variables, like innovativeness (Manning *et al.*, 1995) or opinion leadership (Morrison *et al.*, 2000) could improve the predictive value of the model and therefore strengthen the systematic identification of lead users.

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Appendix

Scale. Lead userness

1. I think Hyves should be better and more advanced.
2. I invent my own new things to do on Hyves.
3. I think I am better at inventing something new for Hyves than other young adults.
4. I invent something new for Hyves, because I think I will somehow be rewarded for it.
5. I am usually the first one to try something new on Hyves.
6. I want to be the only one with something new for Hyves.

Scale. Ahead of a trend

1. I want to do more with Hyves than is possible now.
2. Compared to my friends, I am more early in trying something new on Hyves.
3. I often recommend my friends new possibilities on Hyves.

Scale. Expected benefit

1. When I am busy with Hyves, I am often confronted with problems for which no solutions exist yet.
2. I am not satisfied with Hyves or certain parts of Hyves.
3. I think that there are unresolved problems with Hyves.
4. I have already had problems when I was busy with Hyves.
5. I am looking for better ways to come in contact with my friends than Hyves.
6. I sometimes get frustrated when I am busy with Hyves.

Scale. Expertise

1. I know the website Hyves.
2. I know a lot about Hyves and what I can do with it.
3. I know more about Hyves and what I can do with it than my friends.
4. I can help others when they encounter problems with Hyves.
5. How often do you visit the website Hyves?
6. How often do you send your friends a "krabbel" (message on Hyves)?
7. How often do you update your own Hyves-page?
8. How often do you post gadgets on your own Hyves-page?

Scale. Perceived information benefits

1. I often get information about for example new websites which is valuable to me.
2. I am often the first one who hears information about new websites.
3. When I get information which I know is valuable to a friend of mine, I pass this information through.
4. I often hear that my name is positively named by people I do not know.

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