

Adoption Factors for Mobile Gaming in South Africa

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Abstract

The mobile communications market has reached a fairly mature state with regards to text and voice services and therefore new services are continuously investigated to increase the number of revenue streams generated from the existing mobile phones. One of the possible revenue streams is mobile gaming and it is therefore essential to understand the factors that influence its adoption.

The study focuses on two important adoption factors which are deemed pertinent to the South African telecommunications environment namely the cost of the service and the social influence of this service. The nature of the research question lends itself to a research strategy based on survey sampling to collect data using questionnaires within a cross-sectional time horizon.

The results from the study indicated that the factors influencing the adoption patterns for the South African mobile gaming users are significantly different than those found in a comparative study conducted in Norway in 2002.

Key words: Mobile Technology, Mobile Video Services, Mobile Commerce, Diffusion of Innovation Theory, Technology Acceptance.

1. Introduction

The South African telecommunications scene has seen an astonishing adoption rate of mobile telephones. According to the latest research, the current number of mobile handsets in use in South Africa is estimated at 18.7 million, of which 80% are active customers [1]. For a country with a population of 45 million people this is a phenomenal percentage, especially when compared to an Internet population estimated at around 3 million.

Mobile services evolved from being used primarily as a voice communication medium to include a wide range of services such as messaging services, payment services and also gaming services. The wide scale adoption of both the voice and text services (SMS) is well documented while the introduction of the new mobile services is gaining momentum rapidly in some of the first world countries like the USA and Europe and mobile

gaming is leading the pack. For the purpose of this paper mobile gaming services includes all forms of gaming. According to one of the biggest mobile gaming providers in South Africa, however, it does not look as if the South African mobile gaming market is following the global trend [2].

Because the mobile gaming market is relatively new, only limited research has been done. In order to successfully research the adoption process for mobile gaming, a number of different theories and research models were investigated to identify the model that best describes and predicts the adoption process. Traditionally the diffusion and adoption research were used in the study of ICT services [3] while the uses and gratifications[4] and domestication research[5] were applied to the study of adoption trends of mobile services.

2. Objectives and Hypotheses

The objectives of this research can be stated as follows:

- To assess, through quantitative research, how important two particular variables, namely Subjective Norm and Facilitating Conditions, are for the adoption patterns among young people in South Africa.
- To compare the relative importance of these factors in South African study to a similar Norwegian study.

A number of technology adoption models are explained in more detail below, but the two variables of interest, as defined in the literature review, are the Subjective Norm and Facilitating Conditions (these are defined later). It can be argued that South Africans are more socially attuned than Norwegians because of the South African culture and spirit of “ubuntu” (literally: “the people”). Also, because of the distinctly lower levels of income in South Africa, it is considered that cost (one of the main facilitating conditions) is likely to be a much more important consideration in South Africa than in the relatively wealthy Norway.

The hypotheses can be stated as follows;

- H1_A: Subjective Norm is influential in the adoption process of mobile gaming.

- H1_B: Resource-related (Facilitating Conditions) influences are typically important in the adoption of mobile gaming.
- H2_A: Subjective Norm is more influential on Intention to Use in the South African study than is evident from the results from the Norwegian study
- H2_B: Resource-related influences (Facilitating Conditions) are more important (on mobile game adoption) in South Africa than it is in Norway.

3. Review of Relevant Literature

The adoption trends of information technologies has been researched widely. A number of theoretical models have been suggested to identify the most influential factors in the adoption process. The models have evolved through the various studies and are likely to continue being refined in the quest to establish the most comprehensive model available to predict human adoption behavior. This section reviews the traditional research models to identify the most appropriate factors within the context of South Africa.

The *Uses and Gratifications Research* has been applied to study the uses and gratifications from different media or technologies like video games, Internet [6], household telephones [7] and mobile phones [4]. Lin [8] opines that the “general idea is that adopters seek gratifications in mass media and technology use based in individual needs or motivations.” A study done by Dimmick and Sikand [7] investigated the gratification of the household telephone and the result from the study highlighted three general gratifications: “sociability”, “instrumentality” and “reassurance”. This study was conducted before the widespread adoption of

the mobile telephones but one can expect to have similar needs and motivations from a mobile telephone. Similarly, the expectation is that mobile games adoption may to some extent depend on the individual needs and motivations, thus the relevance of Uses and Gratifications research.

Similarly, *Domestication Research* is useful to the current inquiry since the focus of these studies is in the adoption of an object into everyday life [9] such as technology services like fixed telephony [10], television and home computers [11]. However, due to the lack of domestication research within the mobile gaming area, the only significant area of investigation is the findings from a study conducted by Ling [12] on the adoption of text messaging services. The results highlighted the importance of a mobile phone as a token of “fashion and style”. The results from the study proved the importance of using a mobile phone is moving away from the utilitarian value to a very strong social value.

In the case of Adoption Research, common models and theories that have been applied include the Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB). Ajzen & Fishbein [13] created TRA where the focus was on the behavioural intentions rather than attitudes as the primary determinant of behaviours. The Theory of Reasoned Action has not been widely used to test the adoption of ICT services but Liker and Sindi [14] used it to investigate the user adoption trends of expert systems. The TRA was modified into what became known as TPB, since TRA was limited since it did not include the construct of behavioural control [15]. Therefore, an additional construct of perceived behavioural control was introduced, which resulted in the modified model of TPB [16, 17]. A subset of the modified model (Fig 1) was applied in this inquiry.

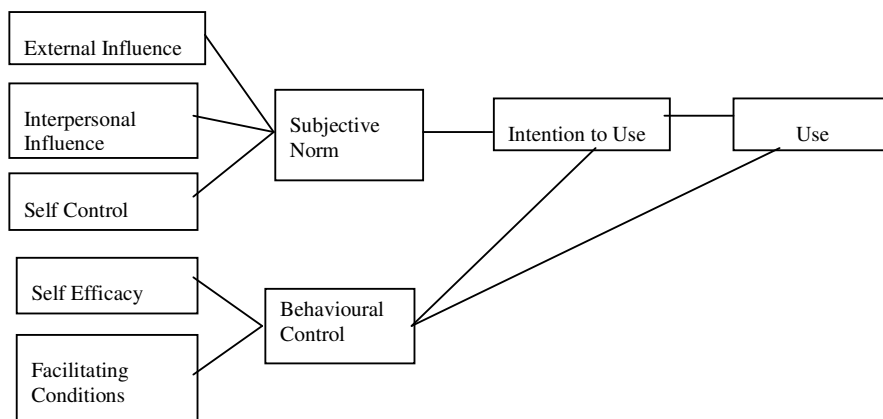


Figure 1: Modified Model of Decomposed Theory of Planned Behaviour

Subjective Norm

Ajzen [18] purports that the Subjective Norm construct is “the perceived social pressure to engage in behaviour” and is determined by ‘the total set of

accessible normative beliefs concerning the expectations of important referents”. This construct therefore creates the social pressure that governs people to act within a certain virtual boundary in

order to conform to the expectations of those people important to them. The Subjective Norm construct is captured by the three factors of external influence, interpersonal influence and self control.

External Influence

According to Pedersen *et al* [19] there are two aspects to external influence that contributes to the importance of Subjective Norm. The first is how the users need to get access to what he refers to as 'symbolic capital' while the second aspect focuses on how external pressure influences the way users develop a specific norm and consequently show a specific behaviour.

It is the second aspect of external influence that was considered significant in this study due to the young target market. The influence of marketing and advertising of mobile services has largely focused on the younger market because they are more vulnerable to external influences like mass marketing, advertising, peer pressure in the process of developing subjective norm[4].

Interpersonal Influence

Findings by Pedersen *et al* [19] in respect of interpersonal influence are that others can also influence a user in terms of the norms that the use of a particular service is expected. This may include for instance the vulnerability of the younger users to social pressure from friends. Other aspects include the importance of gaining symbolic and social capital by using a product or service.

Self Control

The aspect of Self Control has been described by [20] as the belief that the adoption or use of a service or product will lead to the desired effect. Self control is an important determinant of individuality and independence for younger users where the use of the mobile phone is concerned [20]. It is suggested here that Self Control as determinant of subjective norm is more applicable to the mobile phone device itself than mobile gaming services.

Behavioural Control

The modified model has perceived behavioural control as one of the underlying constructs introduced by Taylor *et al* [16]. Azjen [18] defines behavioural control as a person's "perceptions of their ability to perform a given behaviour". The emphasis therefore is on attitudinal influences but within the physical limitations and in the case of mobile gaming the attitude towards mobile gaming might be limited by the knowledge of the high costs involved in using the services or the lack of

knowledge of what service is available. There are two aspects to behavioural control i.e. self-efficacy and facilitating conditions.

Self-efficacy

According to Pedersen *et al* [19] the uses and gratification effect of social capital extends into the element of self-efficacy as a determinant of social norm. The influence of social capital can influence the individual's perception or self-confidence that a specific behaviour will have the desired result. The desired result will be influenced by the group's perspective of the desired result and therefore once again, the strong influence of peer pressure comes to the fore.

The individual's perception of the desired behavior derived from adopting mobile gaming is an important determinant of the adoption trends. The young individual will be more inclined to adopt the mobile gaming services if it is well received within the social group of friends.

Facilitating Conditions

Probably the most important aspect of the research study in South Africa, as with any other technology product or service is that the adoption rate is determined by the facilitating conditions. Facilitating conditions in this instance refers to price, service availability, awareness, support, security and service compatibility [19].

One of the two major concerns for this research is to study the importance of these facilitation conditions in the light of the relatively low income levels and the relatively high costs of mobile services.

- **The cost of the service:** The cost of operating mobile phones is extremely high when compared to other countries. Cost is a huge factor prohibiting the adoption of other services like WAP and GPRS, which in turn limits the adoption rates of mobile gaming services. Another cost element that will be investigated is the impact of hidden costs or at least the perception of hidden costs on the motivation to start using and continue using the service [19].
- **Availability:** Availability refers to the availability of products and services important to the adoption and use of mobile gaming like handsets and connectivity. The availability of handsets with high resolution colour displays created a platform more appropriate for mobile gaming. The gap between the quality of the display on console games and mobile phones is closing, however; it may still take a while for the current generation of handsets to be

replaced,. Although this has a significant impact on the motivation to adopt mobile gaming, it is a structural context variable and was therefore not considered in this research.

- **Awareness:** Awareness refers to the general awareness of what gaming services are available. This includes the available channels to download more games, the method used to download these games or the availability of forums and interest groups. The South African marketing around mobile gaming has not (yet?) been given the same exposure compared to the marketing of mobile services like ring tones, operator logos and voicemail messages.

Implications of Literature Review to the Research

Because of the specific “developing world” context of South Africa when compared to the developing countries, the authors decided to investigate very specifically the importance of Subjective Norm and Behavioural Control constructs in the current adoption pattern of mobile gaming. The authors considered that it is the importance of Subjective Norm and Behavioral Control that may provide useful information in the process of understanding the adoption trends in South Africa. It is believed that the more social culture of South Africa may increase the importance of the Subjective Norm when compared to more “Western” countries. Also, the relatively high cost of the telecommunications infrastructure when compared to average income levels, appears to be threatening to hamper the growth and development of the mobile services.

4. Research Methodology

This research study adopted a positivist approach by relying on the models and instruments which were developed in the context of the Decomposed Theory of Planned Behavior and applying them to a mobile gaming environment.

Research Strategy

The study used a survey strategy. The research instrument is based on the structured questionnaire used in the Norwegian study [24] to ensure comparable results from a South African perspective.

The questionnaire gathers information regarding the different constructs of the Decomposed Theory of Planned Behaviour to determine the factors that influence the user behaviour and intention to adopt new mobile gaming technology.

The research was a cross-sectional study, conducted from July to September 2004. [21]. The sample

selection process used a simple random sampling approach. The target population was young people although these can be separated into three groups;

- School children between the ages of 16 and 18 years
- Young adults between the ages of 19 and 25
- People over the age of 25

The rationale for categorizing the respondents in three distinct groups is based on the belief that the social environment for each of the groups differ and that the elements that influence the decision making also differ across each of the groups.

Research Sampling Issues

When using the simple random sampling approach to data gathering a number of issues were encountered. These issues related to gaining access to respondents across all the age categories. The respondents in the higher age groups were not enticed by the prize on offer compared to the younger audience and therefore the response rate from the higher age groups (25 plus) were extremely low compared to that of the younger age group (19 to 25 years). Questionnaires were distributed amongst students from the three largest universities in the Western Cape province (which includes students from all over South Africa), in a call centre in order to obtain young individuals without any formal tertiary education, and some questionnaires were distributed via mobile phone distributors to obtain responses from under-18s.

Despite the limited reach of the study within the Western Cape and the lack of a profile of the current mobile gaming market, the study aimed to deliver results that will be representative of the South African population.

The survey instrument measured Intention to Use and Actual Use by providing a list of services that are available and requesting the user to complete the usage on a 7 point Likert scale varying from 1 - Never to 7 - Always. This was identical to the Norwegian study [24] which formed the basis for this research study.

5. Discussions of Results

Descriptive Analysis

A total of 204 valid questionnaires were obtained. With 101 female and 103 male respondents, there is an almost perfect spread in terms of gender; though it is unknown whether this is representative of the actual mobile phone user population. The survey

was successful in targeting a young population: 83% of the respondents were between 19 to 25 years of age, and a further 13% between 16 and 18. Of the respondents, 62% used prepaid services with the other 38% having a contract.

Exactly 75% of the respondents played games on their mobile phones, though a full 88% of these played only the games that came pre-installed on their phone; only 1% of the games played online and the other 11% of them had downloaded games.

Instrument Reliability Analysis

As discussed in the Literature Review the decision was made to focus only on the Subjective Norm (SN) and Behavioral Control (BC) measure of the Decomposed Theory of Planned Behavior. Therefore the measures that have been investigated include External Influence that was based on two major sources of influence namely the media and society [22]. The measures used in the Norwegian study which formed the basis for this research was based on original measures proposed by Taylor and Todd [16] but extended by Battacherjee [23]. Self Control focused on measures that included peer pressure, influence from groups and superiors [24]. Self-Efficacy was similarly based on the measure originated from Taylor and Todd [16] and extended by Battacherjee [23]. Facilitating Conditions focused on the importance of infrastructure of mobile service and service provider involvement. The test items for Facilitating Conditions (as well as all other, dependent variables) were basically as the items used by both Battacherjee [23] and Taylor and Todd [16] but adjusted to the mobile gaming services context by Pedersen *et al* [24]. Although it is acknowledged that culture and use of language in South Africa may lead to a different interpretation of the test items here when compared to Europe, most of them are fairly factual in content. Thus it was decided to stick as closely to the original item phrasing as possible in order to allow the comparison with the Norwegian study without introducing possible additional unknown biases. Note also that many of the responses were obtained verbally and transcribed onto the instrument by one of us. During this process there did not seem to be any evidence of possible misunderstandings or cultural bias in understanding any of the test items.

Thus, all the items of this study are based on previously validated measures of which the reliabilities were considered acceptable [19]. However, as a double-check, a factor analysis exercise was done on all five *independent* variables (i.e. not the dependent variables) from the model in order to evaluate their individual factor loadings.

Table 1 identifies the individual factors, the questions that measured the factors and the factor loadings. Factor loadings of less than 0.5 were not included. The factor loading analysis identified five factors which mapped almost perfectly on the five independent measures thus confirming the validity of grouping these measures together to test the construct validity. The only exception was found in four of the Self-Efficacy test items which loaded on the Self-Control construct instead. However, since this construct is not part of any of the hypothesis tests, it was not seen as a major problem. Test items which had a factor loading of less than 0.5 have not been included in the research.

Table 1: Factor Loadings

| | |
|-------------------------------------|---------------------|
| External Influence (SN) | Factor 1 |
| New Service Availability? | 0.58 |
| Well Informed? | 0.69 |
| Marketed Or Not? | 0.74 |
| Heavy User | 0.70 |
| Interpersonal Influence (SN) | Factor 2 |
| Never Heard Of It? | -0.50 |
| What Is Available? | -0.85 |
| Phone Compatibility? | -0.81 |
| Where to get it? | -0.84 |
| Not Advertised? | -0.55 |
| Self-Control (SN) | Factor 3 |
| Talk About Game? | 0.63 |
| Show Games? | 0.54 |
| Express? | 0.62 |
| Impress People? | 0.75 |
| Group? | 0.79 |
| Practice? | 0.60 |
| Self-Efficacy (BC) | Factor 3 ctd |
| Top Performer? | 0.86 |
| Progress? | 0.63 |
| Classmates Opinion? | 0.76 |
| Friends recommend? | 0.81 |
| | Factor 4 |
| Feel Free? | 0.86 |
| My Control? | 0.86 |
| Means & Resources? | 0.66 |
| Facilitating Conditions (BC) | Factor 5 |
| Support & Assistance? | 0.86 |
| Access? | 0.63 |
| Integrated? | 0.61 |
| Service Provider? | 0.79 |
| Compatibility? | 0.61 |

Regression Analysis and Model Testing

This section uses regression analysis to determine the degree of association between each of constructs within the South African environment and to determine the explained variances.

Due to the nature of this study, regression analysis was deemed acceptable as the study does not aim at deriving a new model but rather focus on comparing results from individual constructs between the two studies; previous research used structural equation

modelling to *derive* the model. Figure 2 summarizes the findings. Note that the existence and direction of the relations are stipulated by the theoretical model.

For clarity and due to space considerations, only the relationships and variables relating to the hypotheses are shown in Figure 2 and discussed below. However, the research also found consistently high (all >66%) and significant ($p < 0.01$) correlations between the other four independent variables on Subjective Norm and Behavioural Control respectively This is consistent with the findings of the Norwegian study.

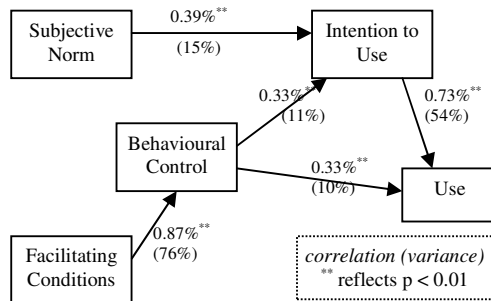


Figure 2: Correlations between Variables

By contrast, it was found that the two variables under investigation, Subjective Norm and Behavioural Control, explained only a relatively small 15% and 11% respectively of the variance in Intention to Use. However, Behavioural Control explained a further 10% of the actual Use of mobile gaming. Facilitating Conditions is a major constituent factor of the Behavioural Control construct. The following discusses these findings in more detail.

Hypothesis Test Results

Hypothesis test 1_A:

H1_A: Subjective Norm is influential in the adoption.

Subjective Norm is described by Ajzen [25] as “the social pressure to engage or not to engage in a behavior”. Subjective Norm is therefore the result of the combination of the expectations from those people whose opinion influences an individual’s behaviour [25]. Table 2 shows the association between Subjective Norm – as measured through the three variables – and Intention to Use mobile services in the South African study.

Table 2: Subjective Norm on Intention to Use

| | Mean | Std.Dv. | r(X,Y) | r ² |
|-------------------------|------|---------|--------|----------------|
| Subjective Norm | 2.79 | 0.87 | 0.389 | 0.151 |
| Intention to Use | 2.31 | 1.60 | | |

The table shows a moderate strength of association between Subjective Norm and Intention to Use of 0.39, i.e. explaining 15% of the variance but the statistical significance is high with a p-value of much smaller than 0.01.

The outcome from the study therefore supports the Hypothesis 1_A that Subjective Norm is influential in the adoption of mobile gaming in South Africa.

Hypothesis test 1_B:

H1_B: Resource-related Facilitating Conditions influences are typically important in the adoption of mobile gaming.

This hypothesis looks at the influence of Facilitating conditions on the Behavioural Control construct, which in turn influences Intention to Use mobile services. Facilitating conditions include factors like the cost of using a service, the infrastructure requirements, the integration of the services and the service provider involvement in the adoption process. Behavioral Control as described by Ajzen (1995) focuses on the belief that factors exist that may “facilitate or impede performance of the behavior” (Ajzen, 1995). The results from the study are summarized in table 3.

Table 3: Facilitating Conditions on Behavioural Control

| | Mean | Std.Dv | (X,Y) | r ² |
|--------------------------------|------|--------|-------|----------------|
| Intention to Use | 2.31 | 1.60 | 0.330 | 0.109 |
| Behavioural Control | 3.03 | 1.12 | | |
| Facilitating Conditions | 3.10 | 1.31 | 0.872 | 0.760 |

Although a very strong association (0.87) was found between Facilitating Conditions and Behavioural Control, the latter showed only a modest (33%) but still highly significant ($p < 0.01$) association with Intention to Use. However, the model hypothesises another more direct association of Behavioural Control with Actual Use and this shows a further 0.33 correlation, explaining more than 10% of the variance in Actual Use.

The result therefore proves the acceptance of the stated hypothesis that the construct of Facilitating Conditions is an important determinant of Behavioral Control.

Hypothesis test 2_A:

H2_A: Subjective Norm is more influential on Intention to Use in South Africa than it is in Norway

Because the same measures were used here as in the Norwegian study, the correlations can be compared directly (Table 4).

Table 4: Norway compared with South Africa

| Comparative Results r(X,Y) | Norway | South Africa |
|---|--------|--------------|
| Subjective Norm ⇔ Intention to Use | -0.01 | 0.39 |
| Facilitating Conditions ⇔ Behavioural Control | 0.27 | 0.87 |
| Behavioural Control ⇔ Intention to Use | 0.16 | 0.33 |
| Behavioural Control ⇔ Use | -0.16 | 0.33 |

Contrary to the expectations based on the theoretical model, the Norwegian Study showed a *negative* correlation between the Subjective Norm and Intention to Use (as well as between Behavioural Control and Use). Note that positive correlations were found for other mobile services. By contrast, a moderate *positive* association of 0.39 in the South African study.

It can be shown that the correlation strength in South Africa is statistically significantly larger than in Norway. Although there appears to be no statistical test to test the inequality between correlation coefficients directly, it can be confirmed that the Norwegian parameter falls outside the confidence interval in the sampling distribution of r for the South African data. Unlike many other statistical summary parameters, the sampling distribution of the correlation coefficient is not very well behaved: it is usually quite skewed and its standard deviation varies greatly depending on the exact value of the underlying population correlation coefficient. However, Fisher's z transformation function maps the r onto a variable $z_r = 0.5 * \ln \left[\frac{1+r}{1-r} \right]$, which is approximately normally distributed. Although the standard deviation of the transformed variable z_r depends on the population correlation coefficient (ρ), it can be approximated by the formula $\rho_z = (n - 3)^{-0.5}$ when N > 50.

For the South African sample, the correlation coefficient of Subjective Norm ⇔ Intention to Use is $r = 0.3886$, the corresponding z_r -value is 0.4101. The standard deviation for z_r is 0.0839. Since we are testing an inequality, we can use a one-tailed interval test. At 1% confidence level ($p=0.01$), the lower boundary of our confidence interval is $0.4101 - 2.33 * 0.0705 = 0.2458$. This corresponds (by reversing the z-transformation) to a correlation coefficient of 0.241 i.e. it is less than 1% probable that the population correlation coefficient is below 0.241. Since the Norwegian correlation coefficient falls well below the bottom interval boundary, the null hypothesis must be rejected and thus our main hypothesis is confirmed.

Hypothesis test 2_B:

H2_B: Resource-related influences (Facilitating Conditions) are more important (on Behavioural Control, Intention to Use and Use) in South Africa than they are in Norway.

This hypothesis investigates the importance of Facilitating Conditions on Behavioral Control as well as Intention to Use and Actual Use when compared with the Norwegian study. The underlying measures included in the constructs were the same as those applied in the Norwegian study and therefore delivered comparative results.

The South African study delivered a much stronger association between Facilitating Conditions and Behavioral Control (association of 0.87 compared to the association of 0.27 from the Norwegian study).

A similar approach can be used to check the confidence interval in the sampling distribution of r for the South African data and see if the Norwegian parameter falls within the confidence interval.

For the South African sample, the correlation coefficient of Facilitating Conditions with Behavioural Control is 0.8676. The corresponding z_r -value is 1.3233. The lower confidence interval boundary (at $p=1\%$) is then $= 1.1589$ and the corresponding r is 0.8207. The Norwegian correlation coefficient of 0.27 falls well outside the confidence interval and we can thus conclude again that the Norwegian correlation is significantly lower than the South African correlation coefficient. Similar calculations show that the correlations of Behaviour Control with both Intention to Use and actual Use of mobile gaming are also statistically significantly larger in South Africa than in Norway ($p<0.01$).

Thus the hypothesis that resource-based Facilitating Conditions have a much larger impact on the adoption of mobile gaming services in South Africa than in Norway is strongly supported.

6. Conclusion

Even though the mobile gaming market is relatively immature, it is essential to develop the infrastructure and to position the service to exploit the opportunities within the mobile communication industry. In order to fully exploit the opportunities it is important to understand what cause people to behave in a certain way or which factors will influence somebody's behavior towards adopting a product or service. This research investigated the potential reasons for an individual's behaviour towards use and intention to use mobile gaming services and to identify how to change the behavior or attitude towards use.

The results from this study showed that Subjective Norm is a moderately important determinant of Intention to Use mobile gaming, though not as strong as found in a previous Norwegian study. However, resource-based Facilitating Conditions were shown to be more important in South Africa than in the previous Norwegian study. The results from the hypotheses testing suggest that there are a combination of factors that influence the behaviour towards use and intention to use a specific service. The literature review identified the importance of the financial, societal and even the political environment on the domestication process before a service is embraced and used frequently. Furthermore it is important to note that research studies conducted in different countries have the potential to deliver completely different results due to the difference in these other factors.

In conclusion this research study proves that an individual's behaviour is a result of the combination of the individual's societal, motivational and attitudinal factors and the facilitation conditions such as the availability of infrastructure, pricing and the awareness of the service.

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