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## Development of an Instrument to Assess Individual IT-Culture

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### **ABSTRACT**

Reconsidering IT usage as part of a cultural phenomenon drives us to envisage the development of a new instrument to assess the construct of Individual IT Culture (IITC). IT-culture is a concept which has started only recently to appear in IS literature. Grounding our research in psycho sociology and the theories of needs and motivation, which have considerably evolved in the last two decades, we propose the development of a new scale to assess this new concept and, through two-step clustering, we apply this new instrument in order to start verifying a users' typology based on the users' IITC.

### **Keywords**

Individual IT-Culture; IITC; IT-needs; IT-motivation.

# Development of an Instrument to Assess Individual IT Culture

## INTRODUCTION

Grounding the present research on a preliminary qualitative work which developed a users' typology based on their IT Culture as defined by Walsh & Kefi (2008), this paper describes the development of a tool to assess users' IT culture.

Reconsidering IT usage as part of a cultural phenomenon identified through the concept of Individual IT Culture (IITC), it appears essential to devise an instrument to assess this new construct if we are to revisit the processes of IT adoption as deemed necessary by many in our field (Benbasat & Barki, 2007).

The concept of IITC, being a new concept, a new scale to assess it has to be developed if we are to use this new concept in possible adoption models. In this article, we first define the constructs under scrutiny in the proposed instrument, then the measurement instrument itself with the various steps which allowed us to develop it.

We finally underline the limitations of the present research as well as possible future directions and corporate applications before concluding.

## IT CULTURE AND THE VARIOUS CONSTRUCTS UNDER SCRUTINY

Moore & Benbasat (1991) reminded us that "well defined constructs are based on theory, and the operationalization of these constructs through measures with high degrees of validity and reliability is a prerequisite for the beginning of a cumulative tradition" (page 193). We therefore first lay down our theoretical bases before operationalizing the investigated constructs.

The concept of IT Culture has started to appear scarcely in Anglo-Saxon IS literature : in 2006 Leidner & Kayworth had only identified two previous works which called upon this concept: Kaarst Brown & Robey 1999 and Kaarst Brown 2004. However the concept of an IT Culture has also started to appear in French language IS literature, mostly in an implicit manner eg Massit-Follea (2002) does remind us that usage is not limited to use and that one can find in the sociology of usage three dimensions: statistics, practice and an imaginary dimension linked to IT Culture. Proulx in 2001 uses the concept of numerical culture ("culture numérique":page 65) understood as the set of intellectual capacities to master computers. In recent works (Nord, Nord, Cormack & Cater-Steel, 2007; Guzman, Joseph, Papamidal & Stanton, 2007) the term has been used to define the culture of the IT group in a company.

In the present study we will use the concept of individual IT culture as defined by Walsh & Kefi (2008) in the Spinning Top Model. In this model, the IT Cultural layer is defined as the result of three sublayers : IT behaviors, IT values and IT basic assumptions.

But IT behaviors are the results of underlying IT values and IT assumptions are IT values which have sedimented over time and have become implicit and unquestioned. IT Culture could then be assessed through IT Values.

However Rokeach (1973) underlined that values are the result of the individual's needs and the needs of his environment; he also indicated that values have a strong motivational component. And through the preliminary qualitative part of the present research we were able to verify that IT Culture could be assessed through three main dimensions: fundamental needs satisfied through IT, IT needs and IT motivation.

### Fundamental needs satisfied through IT usage

As Au, Ngai & Cheng (2008) remind us, Needs Theory relies mostly today on the works of Alderfer (1969), Herzberg, Mausner & Snyderman (1959), Mc Clelland (1965), and Maslow (1943). These works rely themselves on the fact that when a need is not satisfied, the individual will act in such a way that he/she will be able to satisfy that need. Needs are thus seen as an internal force which guides behaviors (Maslow, 1954). However Steel & Konig (2006) underline that key aspects of most modern personality theories can be found in Murray's psychological theory of needs (1938), though it is outdated in some aspects. Murray (1938) divides needs into primary or viscerogenic needs related to our biological nature (e.g. the need for

food) and secondary or psychogenic needs related to our personality (e.g. the need for self esteem). Though Murray identified approximately twenty of these secondary needs, Winter (1996) suggested that only three of them were fundamental : the need for self accomplishment (satisfaction obtained through overcoming obstacles, doing what we are good at), affiliation need (satisfaction obtained through socialization and sharing with others) and the need for power (satisfaction obtained through power, prestige, influence, the capacity to influence other people's well being)

Though the concept of needs can be found implicitly or explicitly in most works in IS research, needs theory has been explicitly called upon in very few works: Au & al (2008); Ching-Sheng W. & Wen-Bin C. (2006) ; Hung-Chang C. & Neng-Pai L., (2004). Through the preliminary interviews it was found that, depending on the user, different fundamental needs can be satisfied through IT usage; beyond power needs, affiliation needs and self accomplishment needs, primary needs are also studied; the category of primary needs was included and studied in the present work as some users' profiles described in past literature, and also found in the field, satisfy primary or viscerogenic needs through IT, IT use being close to an addiction to those users, thus close to their biological needs.

### **IT motivation and emerging IT-needs**

Most need theoreticians have also called upon the concept of motivation (e.g. Maslow whose ambition in his work on needs was to formulate a "positive theory of motivation": Maslow, 1954), as motivated behaviors have been shown to fulfill needs of competence, autonomy and relatedness (Ryan & Deci, 2000). Motivation theory was applied in IS to attempt understanding IT adoption and usage (Davis, Bagozzi & Warshaw, 1992 ; Venkatesh & Speier, 1999). However all dimensions of motivation have not been exploited; furthermore motivation theory has also evolved in the last two decades. The main difficulty encountered in defining the motivational sub-constructs we wished to adapt to the IS field is that different authors give sometimes different definitions of the same constructs. We have attached ourselves to follow definitions given by the original authors who defined each of these constructs.

Motivation is a psychological process which results from the interaction between an individual and his environment (Latham & Pinder, 2005). As a concept it has been defined as "the hypothetical construct used to describe the internal and/or external forces that produce the initiation, direction, intensity, and persistence of behavior (Vallerand & Thill, 1993). Self determination theory (Deci & Ryan) has shown that as long as people's needs are satisfied through some activities, they will be motivated to engage in these activities without external prodding and through their own choosing.

Vallerand (1997) reviewed extensively motivation literature and reminded us of the three different types of motivation: *intrinsic motivation*, *extrinsic motivation* and *amotivation* at three levels of generality situational (state level), contextual (life domain level) and global (personality level).

The concept of intrinsic motivation has been defined as "doing an activity for its inherent satisfaction rather than for some separable consequence" (Ryan & Deci, 2000 p.56). Vallerand (1997, 2007) highlighted a tripartite distinction in this construct and posited the existence of three types of intrinsic motivation: to know (satisfaction to learn) , to accomplish things (satisfaction to accomplish, create something, to surpass oneself) and to experience stimulation (satisfaction mainly associated with one's senses).

The second motivational construct under scrutiny is extrinsic motivation "that pertains whenever an activity is done in order to attain separable outcome" (Ryan & Deci, 2000 p. 60), "as a means to an end, and not for its own sake" (Vallerand,2007). Self Determination Theory (Deci & Ryan, 1985) proposes a taxonomy of human motivation and a continuum of extrinsic motivation with differing degrees of autonomy or self-determination from the least autonomous (externally regulated with an "external locus of causality": Ryan & Deci, 2000), to the most autonomous (integrated regulation, assimilated to the self, congruent with one's needs and values), through introjected regulation ( to attain pride and/or ego-enhancements) and identified regulation (accepted as one's own because outcome is perceived as important to achieve one's goal).

The third motivational construct considered is amotivation, the state of "lacking an intention to act" resulting from various beliefs. Vallerand (1997) also reminds us of the ongoing works of Pelletier and his colleagues about the concept of amotivation identifying a four-factor model of amotivation due to *capacity-ability* beliefs, *strategy* beliefs, *capacity-effort* beliefs and *helplessness* beliefs (p. 282).

In the present research, the concepts of fundamental needs satisfied through IT, IT-needs, extrinsic motivation and intrinsic motivation are applied to IT, in order to have an adequate and sufficiently refined reading of the users' IT Culture and despite the fact that we do expect that some sub-constructs will have to be eliminated due to redundancy between some of the studied fundamental needs satisfied by IT and motivations. But the literature review, though extensive, did not allow us to do theoretically so a priori.

The construct of amotivation was eliminated from the present work: as amotivation is described as the absence of any kind of motivation and we included all forms of known motivation, it was therefore deemed unnecessary in this study. However, this does not mean that this construct is not important to study in order to have a thoroughly refined view of the users' IITC; it should be studied separately from the tool developed in the present study and a separate scale developed specifically for this construct, could probably also prove useful.

Using the works of Vallerand (1997), a threefold *construct of intrinsic IT motivation* is defined which includes:

- *Intrinsic motivation to know*: IT usage is motivated to discover, understand, learn new softwares.
- *Intrinsic motivation to accomplish*: IT usage is motivated to excel and master adequately one's IT tools.
- *Intrinsic motivation for stimulation*: IT usage corresponds to the search for pleasant sensations, for pleasure, for sensory satisfaction.

Using the works of Deci & Ryan (1985), a threefold *construct of extrinsic IT motivation* is defined (although originally Deci & Ryan defined a fourfold model: the last dimension, introverted regulation, is left aside as considered too close to intrinsic motivation; this last dimension has also been eliminated from several of the latest psycho-sociological studies) :

- *External regulation*: One knows that one has to use IT (to do one's work properly, to communicate adequately with one's peer group,...). One is compelled to use IT, by one's boss, teachers, family, entourage, Usage is not performed through one's own free will.
- *Introjected regulation*.. The self does not yet regulate the choice to use IT (Deci & Ryan, 1985) but one imposes other people's choice on oneself. IT usage is performed to enhance self-esteem, to valorize oneself with respect to people which are deemed important for oneself.
- *Identified regulation*: Through self-determined choice, one uses IT because one knows it is important for oneself in order to achieve other purposes considered important for the self; IT usage is congruent with one's goals and values.

Finally applying Vallerand's levels of generalization, we posit that depending on users, IT needs (needs related to IT) also emerge at three levels of generality (situational, contextual and global) and we define the *construct IT-needs*:

- Situational IT needs: need for specific softwares in order to fulfill given tasks (but not all tasks) to be accomplished in a given context (work, leisure, academic,...contexts)
- Contextual IT needs: need to use IT globally in some context(s)
- Global IT needs: need for IT in all aspects of one's life. Use of IT is implicit in one's everyday life. If compelled, one might do without it but with difficulty and discomfort.

## MEASUREMENT INSTRUMENT

### Existing measurement instruments

Though the concept of IT Culture is a new concept which has not been assessed previously in the literature, three scales developed and used in past IS research were studied. These scales, which used respectively the concepts of motivation and needs, are the scale proposed by Davis, Bagozzi & Warshaw (1992) in their study of extrinsic and intrinsic motivation in the workplace, the scale proposed by Venkatesh & Speier (1999) which studied users' moods, and finally the scale proposed by Au, Ngai & Cheng (2008) in their study of user's satisfaction with their equitable needs fulfillment model.

While studying these scales, we kept in mind the fact that "however well validated an instrument may have been in its original form, excising selected items from a validated instrument does not result in a derivative instrument" (Straub & Curtis, 1989)

The scale of Davis & al was rejected for several reasons. First it was grounded in scales previously developed while reading those scales through the lens of motivation; it did not propose the development of a new instrument. Usage has evolved and mutations have happened (Markus & Saunders, 2007; Massit-Follea 2002). Our field has been calling for new approaches (Benbasat & Barki, 2007) and some highly used scales are considered outdated (Garland & Noyes 2008). Furthermore, Davis & al only limited their study to the general constructs of intrinsic & extrinsic motivation without looking into the various dimensions of these constructs as developed in the literature.

The scale used by Venkatesh & Speier (1999) was rejected because it used previously defined scales including Davis' & al (1992) and again used motivation theory in a very limited way with respect to its more recent developments.

The scale used by Au & al was also rejected as the approach was too different from our own approach particularly concerning the fulfillment of higher order needs, which we do not view through the same perspective. This particular point has led to many debates in past literature but is beyond the scope of the present paper.

No valid and reliable scales having been identified to measure the constructs under scrutiny within the IS field, we borrowed from psycho sociology, inspired ourselves from the latest scales developed and used in this field, then proceeded to develop specific items adapted to our own field and new scales for the various proposed constructs.

The scales investigated from the psycho sociological field were:

- Self-Determination Scale (Sheldon, Ryan & Reis, 1996).
- Basic psychological needs satisfaction scales (currently being researched by a team of researchers including Deci & Ryan, 2008)
- Global motivation scale (Guay, Mageau & Vallerand, 2003)
- Fundamental needs satisfaction scale in sports context (Gillet, Rosnet, & Vallerand, 2008)

### **Instrument development process**

The development of the scale resulted both from the theoretical grounding of the research and from a preliminary qualitative research done in corporate and societal fields and through 54 semi-centered interviews. Items were developed along the three dimensions of fundamental needs satisfied through IT use, emergent IT needs and IT motivation; terms used in the items were in many instances inspired by the verbatim of the interviewees of the preceding qualitative field work.

Development of the instrument was carried out in four stages. The first stage was item creation. From the preceding qualitative study, which had identified nine archetypal users, we created a pool of items for each of these along the three pre-defined axes and various sub-constructs:

- (I) Fundamental needs satisfied through IT
  - a) Primary needs
  - b) Power needs
  - c) Affiliation needs
  - d) Self accomplishment needs
- (II) IT needs
  - a) Situational IT-needs
  - b) Contextual IT-needs
  - c) Global IT-needs
- (III) IT motivation
  - a) Intrinsic IT-motivation
    - To know
    - To accomplish
    - To experience stimulation
  - b) Extrinsic IT-motivation
    - External regulation
    - Introjected regulation
    - Identified regulation

Then all items were pooled together and reorganized around the three dimensions; doubles were eliminated and those items which appeared ambiguous or inappropriately worded were modified. The overall instrument, created by randomly ordering the items from the 13 sub-scales into a common group, was first tested for qualitative reliability on a small sample of respondents (40) which included some of those who had participated to the preliminary qualitative study. Responses were analyzed. Questionnaire responses corresponding to respondents who had partaken to the previous qualitative study were correlated to their verbatim. Those who had not partaken to the qualitative study were interviewed and invited to comment. Analysis of these first responses permitted correction of the weaknesses in the instrument and induced readjustment of some items incorrectly worded, the elimination of one unnecessary item and the addition of about another dozen items which allowed further refinement of the scale.

Once the scale was deemed complete and qualitatively reliable, it was submitted to a methodological, statistical expert. The IT need dimension being considered of utmost importance in the reading of the users' IT-cultural profiles, the subscales being cumulative and the pool of items corresponding to this dimension leading possibly to too many varied interpretations, it was decided to group all items corresponding to this dimension into one multi-choice question: it gave a choice of IT-need profiles shortly but accurately described, amongst which the respondents were to choose one which was the closest to their perception of their own IT-needs. The other items were validated by the consulted expert.

The second stage was a pre test on all employees of a small consultancy firm (25 respondents) specialized in statistical data treatment, who had not previously been implicated at all in the study. Each resulting profile was qualitatively and individually analyzed with the consultants. Only one appeared incorrect. However the questionnaire was not administered to this particular respondent in a language in which he was fluent and the inadequate resulting profile was put aside as due to inadequate understanding of the items. The questionnaire was subsequently verbally translated into English which the respondent understood properly though English was not his native language. Subsequent scores were then analyzed and deemed coherent.

A first pilot test was then done on 70 university students (2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> years), 20 university administrative staff and a dozen available professionals.

This first pilot test lead to final refinements of the wording of some questions and the adding of two complementary items.

The second pilot test included 243 respondents who happened to live in France at this particular time (but all respondents were not French) and was purposely done on mixed societal samples: based on the Spinning Top Model (Walsh & Kefi, 2008), if we are to be able to measure “central tendencies” in a cultural phenomenon, we should have a population as diversified as possible.

This last population of 243 respondents (see demographic statistics in Table 1) , included:

- Inhabitants from low rent dwellings
- University and business school students (including a group of 18 Chinese students on an exchange program)
- Business school and university administrative staff
- Members and staff of a sports center
- Various professionals from diverse organizations following courses in a business school.

**Table 1: Demographic statistics of second pilot test**

| Gender         |                     | Age group          |                    |                    |                      |          |           |
|----------------|---------------------|--------------------|--------------------|--------------------|----------------------|----------|-----------|
| Men            | Women               | [10-19[            | [20-29[            | [30-39[            | [40-49[              | [50-59[  | [60-69[   |
| 118            | 125                 | 32                 | 153                | 23                 | 22                   | 9        | 4         |
| Academic Level |                     |                    |                    |                    |                      | Position |           |
| No degree      | High school diploma | 2 years university | 3 years university | 4 years university | >=5 years university | Students | Corporate |
| 29             | 18                  | 104                | 56                 | 18                 | 18                   | 145      | 98        |

.In this second pilot test the aim was to identify the constructs which were not useful in the scale. As we had developed the scale along four main axes (IT-needs, fundamental needs satisfied through IT, IT intrinsic motivation, IT extrinsic motivation) with the last three axes (totaling 10 sub constructs) having common theoretical groundings, we knew we would have to eliminate some of the sub-constructs.

Therefore, and as preliminary work, using SPSS 14 software, each set of sub-constructs along the last three axes was verified separately by principal components factor analysis (PCA) and clean factor loadings were found with mostly fairly high Cronbach's alpha (between 0.8 and 0.9 except for two between 0.7 and 0.8 and one over 0.9) . Then items/constructs were tested by pairs of axes, with items of each pair of axes pooled together, PCA was again applied and unnecessary sub-constructs were eliminated : the construct of IT intrinsic motivation to accomplish was unsurprisingly found to load with the construct of self accomplishment needs satisfied through IT; the construct of IT-intrinsic motivation to experience stimulation was found to load with the construct of primary needs satisfied through IT; finally the construct of IT extrinsic motivation with introjected regulation was found to load together with power needs satisfied through IT.

The process of elimination of the three redundant subconstructs was done in several steps: all items loading to the same factors were analyzed, the qualitative importance of each item in the concerned sub-construct, the item-item correlations within each sub-scale, the effects on Cronbach's alpha if each individual item was deleted, and the item standard deviation scores were all used to determine which items were to be deleted from each pair of merged sub-scales.

This allowed us to bring down the number of subconstructs in the final scale to  $7 + 1$ , i.e. 8 factors. Having started with a scale which included 13 constructs and 55 items, we ended up with an 8 constructs and 25 items scale. The length of survey instruments is an ongoing concern to quantitative researchers (Moore & Benbasat, 1991). The developed tool being supposed to be administered and used in corporate settings, a number of items as limited as possible was aimed at, though it was at the same time of utmost importance to capture all possible aspects of the concept of IT culture which is a new concept. We therefore estimated that a 25 item scale was adequate even though we could have reduced it further (see details of global PCA below). The final scale can be found in Appendix 1.

Concerning the presentation of the questionnaires and possible answers, after trying in pre-test stages, 7-point then 5-point Likert answering scales, we finally decided for the final questionnaire tested in the last field pilot study on 7 point Likert answering scales, ranging from 1 to 7: "not true at all" to "completely true" through "approximately true" in mid position; this presentation was adapted from the "basic psychological needs satisfaction scales" currently still in the process of being researched by Deci, Ryan and their team.

Demographic variables (gender, age, position, etc) were also included in the questionnaires which allowed us to keep track of our population.

## **INSTRUMENT VALIDITY**

It was chosen not to use e-questionnaires. The instrument developed is supposed to assess IT-culture. Therefore, if we are to attempt capturing the full array of possible IT-cultural profiles and also include those respondents who have no particular IT-needs or those who are not IT-motivated, we are compelled not to use e-questionnaires. Therefore all questionnaires in the four stages described above, were hand filled by the respondents and answers were hand computed. This eliminated a possible method bias.

### **Content validity**

Global content validity was mainly based on motivation and needs theory literature applied to IS and qualitative content validity was obtained through the first two stages described above and through triangulation between interviews verbatim and questionnaires answers for those who had participated to both the qualitative and quantitative parts of the research. For the other respondents, informal exchanges and interviews after questionnaires answers were analyzed, provided the necessary triangulation.

Two of the people involved in the development and reduction of the various sub-scales being intercultural management teachers in Masters courses in French business schools (one of them teaching needs and motivation theories for several years), they were therefore considered experts in the field and participated to all the stages of the review process of the various sub-scales thus fulfilling Cronbach's suggestion to have experts in the field validate the content of the scales (Cronbach, 1971).

### **Construct validity**

Using the SPSS 14 software, what Straub, Boudreau & Gefen (2004) name "mandatory validities" (i.e. discriminant, convergent and factorial validities) of the final scale, administered to 243 respondents, were verified through PCA with Oblimin rotation with Kaiser normalization .

As we had started with what we knew would probably include redundant sub-constructs and proceeded through the various stages to gradual elimination of unnecessary sub-constructs, we a priori knew how many sub-constructs we wanted to study and required 7 factors to be extracted (the eighth factor, IT-needs, was not included in the PCA as it is assessed through a multi choice item) . At the final stage one last item PRIMNEE1 (item n°3: "I spend a great part of my free time on my computer" ) had to be eliminated because it loaded approximately equally on factors 4 & 5 at 0.48 & 0.40 respectively (Churchill, 1979). This explains why factor 5 has only two items whereas all other sub-constructs have 3 or 4 items.



The rotated pattern matrix is shown in Table 2. The Oblimin rotation shows that items of each construct loaded significantly on their intended construct which insures convergent validity (Straub, 2004).

**Table 2 : Results of the principal components factor analysis done on final IITC scale**

| Constructs   | Pattern Matrix(a) |             |             |               |             |             |             |               | Cronbach's alpha on standardized items |
|--|-------------------|-------------|-------------|---------------|-------------|-------------|-------------|---------------|--|
|  | Labels            | 1,00        | 2,00        | 3,00          | 4,00        | 5,00        | 6,00        | 7,00          |  |
| Self accomplishment needs  | ACCNEE3           | <b>0,90</b> | - 0,04      | 0,00          | - 0,02      | 0,03        | - 0,02      | - 0,06        | <b>0.892</b>                           |
|  | ACCNEE1           | <b>0,85</b> | 0,06        | 0,02          | - 0,02      | 0,07        | 0,08        | - 0,07        |  |
|  | ACCNEE2           | <b>0,58</b> | - 0,21      | - 0,05        | - 0,01      | 0,03        | 0,20        | - 0,23        |  |
|  | ACCNEE4           | <b>0,50</b> | - 0,01      | - 0,27        | 0,07        | 0,06        | 0,26        | 0,08          |  |
| Extrinsic motivation extroverted regulation  | EXTMOTEXT1        | - 0,02      | <b>0,85</b> | 0,02          | - 0,07      | 0,01        | - 0,02      | 0,01          | <b>0.854</b>                           |
|  | EXTMOTEXT2        | - 0,05      | <b>0,79</b> | - 0,04        | 0,05        | 0,07        | - 0,13      | 0,09          |  |
|  | EXTMOTEXT3        | 0,16        | <b>0,78</b> | - 0,13        | 0,06        | - 0,07      | - 0,15      | 0,14          |  |
|  | EXTMOTEXT4        | - 0,13      | <b>0,75</b> | - 0,01        | - 0,18      | 0,01        | 0,13        | - 0,23        |  |
| Power needs  | POWNEE1           | - 0,12      | - 0,02      | - <b>0,88</b> | - 0,05      | 0,00        | - 0,04      | - 0,06        | <b>0.866</b>                           |
|  | POWNEE3           | 0,05        | 0,07        | - <b>0,86</b> | 0,06        | - 0,06      | 0,03        | 0,02          |  |
|  | POWNEE2           | 0,01        | 0,00        | - <b>0,81</b> | - 0,04      | - 0,02      | 0,16        | 0,00          |  |
|  | POWNEE4           | 0,12        | 0,05        | - <b>0,73</b> | 0,06        | 0,10        | - 0,22      | - 0,00        |  |
| Affiliation needs  | AFFNEE3           | - 0,02      | - 0,01      | 0,03          | <b>0,85</b> | - 0,03      | 0,04        | 0,05          | <b>0.740</b>                           |
|  | AFFNEE1           | - 0,09      | - 0,11      | - 0,04        | <b>0,82</b> | 0,06        | 0,01        | 0,01          |  |
|  | AFFNEE2           | 0,08        | 0,11        | - 0,00        | <b>0,63</b> | 0,03        | 0,06        | - 0,31        |  |
| Primary needs  | PRIMNEE2          | 0,01        | - 0,10      | - 0,01        | - 0,02      | <b>0,92</b> | - 0,03      | - 0,02        | <b>0.829</b>                           |
|  | PRIMNEE3          | - 0,00      | 0,14        | 0,03          | 0,02        | <b>0,91</b> | 0,05        | 0,02          |  |
| Intrinsic motivation to know   | INTMOTKNO3        | 0,07        | - 0,01      | 0,09          | 0,05        | 0,07        | <b>0,78</b> | 0,12          | <b>0.805</b>                           |
|  | INTMOTKNO2        | - 0,02      | - 0,18      | - 0,08        | 0,18        | 0,04        | <b>0,71</b> | - 0,11        |  |
|  | INTMOTKNO1        | 0,27        | - 0,08      | - 0,07        | 0,01        | - 0,00      | <b>0,64</b> | - 0,13        |  |
| Extrinsic motivation identified regulation   | EXTMOTID1         | - 0,13      | 0,01        | - 0,10        | 0,03        | - 0,00      | 0,15        | - <b>0,81</b> | <b>0.819</b>                           |
|  | EXTMOTID2         | 0,07        | - 0,12      | - 0,06        | 0,07        | 0,10        | - 0,11      | - <b>0,73</b> |  |
|  | EXTMOTID3         | 0,23        | 0,21        | 0,05          | 0,09        | - 0,04      | - 0,10      | - <b>0,68</b> |  |
|  | EXTMOTID4         | 0,31        | - 0,13      | 0,05          | 0,05        | 0,04        | 0,02        | - <b>0,64</b> |  |
| Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization. |                   |             |             |               |             |             |             |               |  |
| a Rotation converged in 9 iterations.  |                   |             |             |               |             |             |             |               |  |

**Table 3**

As shown in Table 3, the Kayser Meyer Olkin (KMO) measure of sampling adequacy was good at 0.844. Bartlett's Test of sphericity with a proximate Chi-Square of 3123, 388 is acceptable, more especially as the number of respondents was not very high.

|  |                    |          |
|--|--------------------|----------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. |                    | .844     |
| Bartlett's Test of Sphericity                    | Approx. Chi-Square | 3123,388 |
|  | df                 | 276      |
|  | Sig.               | .000     |

The results displayed in Table 2 also allow us also to assess the discriminant validity of our scale: the items of each construct loaded more highly on their construct than on any other which implies good discriminant validity (Straub & al, 2004).

**Table 4 : Total variance explained**

| Component | Initial Eigenvalues |               |              | Extraction Sums of Squared Loadings |               |              | Rotation |
|-----------|---------------------|---------------|--------------|-------------------------------------|---------------|--------------|----------|
|           | Total               | % of Variance | Cumulative % | Total                               | % of Variance | Cumulative % | Total    |
| 1         | 6,820               | 28,416        | 28,416       | 6,820                               | 28,416        | 28,416       | 4,478    |
| 2         | 3,821               | 15,921        | 44,336       | 3,821                               | 15,921        | 44,336       | 3,760    |
| 3         | 2,010               | 8,374         | 52,710       | 2,010                               | 8,374         | 52,710       | 3,454    |
| 4         | 1,847               | 6,863         | 59,573       | 1,847                               | 6,863         | 59,573       | 3,200    |
| 5         | 1,551               | 6,462         | 66,035       | 1,551                               | 6,462         | 66,035       | 2,484    |
| 6         | ,922                | 3,842         | 69,877       | ,922                                | 3,842         | 69,877       | 3,554    |
| 7         | ,833                | 3,471         | 73,348       | ,833                                | 3,471         | 73,348       | 3,833    |

The total variance explained by the 7 constructs (see Table 4) in the PCA is of 73.348 % which meets standard thresholds (Hair, Anderson, Tatham & Black, 1995). We could have opted for 5 factors if we had limited the PCA to factors with Eigenvalues strictly greater than 1, more especially as the scree plot showed a break after the fifth factor (see figure 5); We however wanted a reading of the users' IITC as refined as possible; we therefore decided to keep the extra factors 6 and 7 as our theoretical groundings implied that these two factors could be important. The items corresponding to these two factors could subsequently be eliminated if one wanted to administer a shorter version of the global scale.

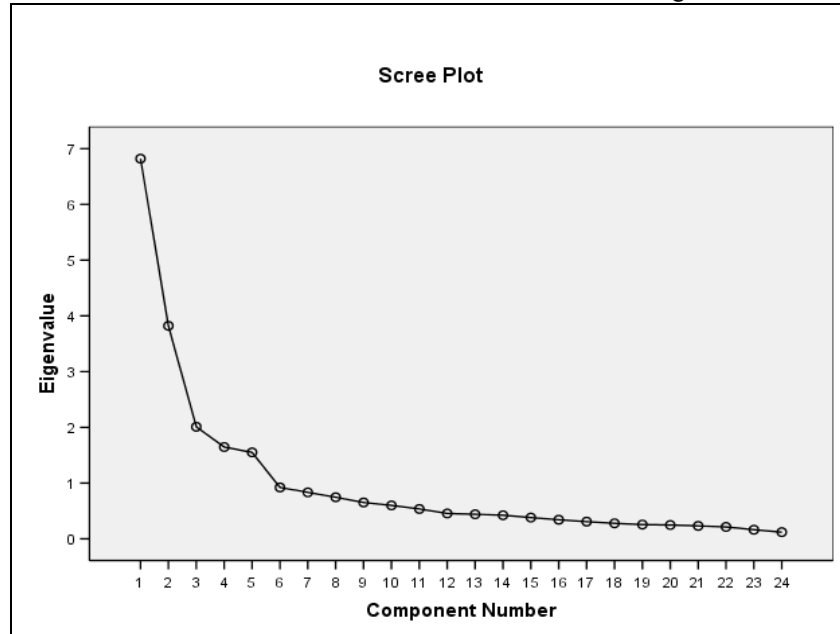


Figure 5 : Scree Plot

### Reliability

In order to gauge the extent of the random error (reliability), some “maximally similar” items (Campbell, 1950: page 50) were included in the questionnaire.

Cronbach’s alpha (Cronbach, 1970) was checked for each sub-construct and, when we started developing the scale, minimum reliability target was set to be over 0.80. Although Nunnally (1967), allowed for values as low as 0.60 (exploratory research) and 0.70 (confirmatory research), our field appears to often require nowadays alphas over the 0.80 level.

In the final scale, this was met for all constructs (see last column on the right of Table 1) except for the construct “affiliation needs satisfied through IT” (AFFNEE) which was however deemed acceptable at 0.740.

The scale tested having been developed specifically for this study, the overall results were deemed acceptable, though they could certainly be improved.

### APPLICATION OF THE INSTRUMENT ON THE DATA OF THE FINAL FIELD PILOT TEST

Nine archetypal profiles were identified in the preceding qualitative work which made up 3 groups:

- 1) The *dodger* group: this group refuses anything to do with IT; IT is considered a “punishment” which should be avoided at all cost. This group has no need for IT and is indifferent to it.
- 2) The *pro-active* group: in corporate settings this group is perceived by project managers as a facilitating influence in the adoption processes. If they are allowed to do so, they get involved in new corporate IT projects from the stage of studying the business requirements and they often participate in the choice of software and in software adaptations. This group includes four archetypal profiles: *studious*, *interested*, *dangerous* and *passionate*. All appear to have some intrinsic motivation but of different kinds, and global IT-needs.
- 3) The *passive* group: this group only intervenes in an IT project when confronted to the necessary and mandatory use of IT in their day to day work/private life. In order to fulfill their affiliation needs and to conform to their reference

groups, users belonging to this group will use new IT tools that they are compelled to use and will apply what will apply what they have been taught, but will not try to go beyond this unless they have an urgent concrete need to do so to fulfill their mandatory tasks. This group includes four archetypal profiles: *disciplined*, *frightened*, *disabused*, *constrained*. The motivation of the members of this group is primarily extrinsic and their IT-needs are either contextual (for the first two sub-groups) or situational (for the last two sub-groups).

We propose to start verifying this typology through the gathered data and applying the instrument developed in the first part of the present article by cluster analyses. “Although viewed principally as an exploratory technique, cluster analysis can be used for confirmatory purposes. If a proposed structure can be defined for a set of objects, cluster analysis can be applied and a proposed typology (...) can be compared with that derived from the cluster analysis” (Hair & Black, 1998).

The first group which was identified through our data was the “dodger” group constituted of individuals who declared they had strictly no IT needs (First choice in item n° 1, MCQ, in questionnaire, see Appendix 1). In our limited sample of 243 respondents, we only identified two of them (ITNEE= 1) . As the number of respondents identified in this group was too small to carry a proper analysis of the other variables, these two individuals were removed from the subsequent cluster analysis. Even though we had taken the precaution not to use e-questionnaires to avoid discouraging *dodgers*, through questionnaire administration we faced several people who just refused to fill the questionnaires as soon as they knew it was to do with IT. A qualitative study (which would allow one to one, personalized exchanges) only centered on these users would probably be extremely useful.

We also had to eliminate another respondent from the cluster analysis. This respondent was identified as having given what could be considered as random answers. He was a Chinese exchange student who could be supposed to have some language difficulties. All other respondents were included in the cluster analysis leaving a total of 240 respondents with the categorical variable ITNEE at the values of 2 (situational IT needs), 3 (contextual IT needs) or 4 (global IT needs).

### Two step Cluster analysis

Through SPSS 14 software, we chose to proceed with two step clustering as we had a categorical variable (item 1 who identified IT-needs) mixed with continuous variables (the seven factors identified by PCA in the first part of this article). This categorical variable identifying each user’s IT-needs appeared to be a determinant variable in the typology brought to light in the preliminary qualitative part of the research.

Log-likelihood criterion was used as we had a mixture of continuous and categorical variables. We did not specify the number of clusters leaving the algorithm select the optimal number based on the Schwartz Bayesian Criterion (BIC). We did not use the option to create a separate cluster for cases that did not fit well into any other cluster as we had, a priori, eliminated those. Results of the auto- clustering process are given by table 5.

The cluster profiles based on the seven factors identified in the first part of the present article together with the within cluster variations and continuous variablewise importance are produced respectively in Appendix 2, 3 and 4.

**Table 5 : Auto clustering**

| Number of Clusters | Schwarz's Bayesian Criterion (BIC) | BIC Change(a) | Ratio of BIC Changes(b) | Ratio of Distance Measures(c) |
|--------------------|------------------------------------|---------------|-------------------------|-------------------------------|
| 1                  | 1738,048                           |               |                         |                               |
| 2                  | 1484,553                           | -253,495      | 1,000                   | 1,571                         |
| 3                  | 1355,129                           | -129,424      | ,511                    | 3,373                         |
| 4                  | 1378,458                           | 23,329        | -,092                   | 1,153                         |
| 5                  | 1410,349                           | 31,891        | -,126                   | 1,156                         |
| 6                  | 1449,759                           | 39,410        | -,155                   | 1,209                         |
| 7                  | 1497,518                           | 47,759        | -,188                   | 1,049                         |
| 8                  | 1547,138                           | 49,620        | -,196                   | 1,207                         |
| 9                  | 1603,297                           | 56,159        | -,222                   | 1,108                         |
| 10                 | 1662,524                           | 59,227        | -,234                   | 1,049                         |
| 11                 | 1723,093                           | 60,569        | -,239                   | 1,037                         |
| 12                 | 1784,635                           | 61,542        | -,243                   | 1,186                         |
| 13                 | 1850,269                           | 65,635        | -,259                   | 1,034                         |
| 14                 | 1916,624                           | 66,354        | -,262                   | 1,024                         |
| 15                 | 1983,480                           | 66,856        | -,264                   | 1,064                         |

a The changes are from the previous number of clusters in the table.

- b The ratios of changes are relative to the change for the two cluster solution.
- c The ratios of distance measures are based on the current number of clusters against the previous number of clusters.

Three clusters (see table 6) were identified by the software which followed the categorization given by the variable IT-needs with no exceptions. Two step cluster analysis thus confirmed the fact that the categorical variable ITNEE (IT needs) was a determinant variable.

The two-step clustering also shows (see appendix 2-3-4) that beside the categorical variable IT-needs, the main factors which appear to allow us to identify cluster 1 from cluster 2 are:

- All fundamental needs (except power needs) satisfied through IT
- Extrinsic motivation through identified regulation.

**Table 6: Frequencies**

|           | ITNEE= 2  |         | ITNEE= 3  |         | ITNEE= 4  |         |
|-----------|-----------|---------|-----------|---------|-----------|---------|
|           | Frequency | Percent | Frequency | Percent | Frequency | Percent |
| Cluster 1 | 46        | 100,0%  | 0         | ,0%     | 0         | ,0%     |
| 2         | 0         | ,0%     | 0         | ,0%     | 71        | 100,0%  |
| 3         | 0         | ,0%     | 123       | 100,0%  | 0         | ,0%     |
| Combined  | 46        | 100,0%  | 123       | 100,0%  | 71        | 100,0%  |

Cluster 2 with global IT-needs (ITNEE=4) thus appears to correspond to the *pro active* group, Cluster 3 to the first sub group of the *passive* group with contextual IT-needs (ITNEE=3) and Cluster 1 to the last sub-group of the *passive* group with situational IT-needs (ITNEE=2).

**LIMITATIONS AND FUTURE DIRECTIONS**

The main limitation of the present research is the fact that the population on which the instrument was tested is not sufficiently diversified. The developed instrument should be tested on populations which respect the natural demographic and social equilibriums found naturally in the country in which it is being tested. Also, to be fully validated, the instrument should be tested on populations from different countries. Finally, two step clustering being more adapted to big populations, results would have to be confirmed on bigger samples of respondents.

Though 2-means clustering allowed us to confirm the importance of the variable IT-needs and confirmed the previously identified 3 main groups of users, k-means clustering should also be applied to each of the three main clusters in order to investigate the sub-groups of users previously identified in the preceding qualitative part of the research . We should therefore proceed with 4-means clustering for main cluster 2, and with 2 means clustering for main cluster 1 and with 2-means clustering for main cluster 3 to investigate if we could identify the various sub groups.

Once the instrument is properly validated as well as the various sub-groups of users identified, we could propose to include the variable IITC in adoption models and re-visit past research. As an example of questions which could be investigated, we can cite:

- Is IITC an antecedent variable to user’s involvement ?
- Could we propose an IS success model which includes the variable IITC ?
- Is IITC an antecedent or a mediating variable to adoption ? Etc.

Concerning corporate applications and if a human resource tool based on the devised instrument is developed, it could allow us to customize IT training in organizations.

**CONCLUSION**

In this article we have described the process of developing an instrument to assess Individual IT-Culture, a new concept which has only recently appeared in the literature. The result is a 25 item scale which includes 8 constructs with what can be

considered an acceptable degree of construct and content validity as well as reliability. The items developed were worded to fit IT in general and not a particular, specific technology, nor a specific context. Though there is certainly room for improvement (particularly concerning the 2-item, 0.740 affiliation need factor), this instrument should be easily manageable for further testing (which should be done on populations as diversified as possible) and could be used to test possible new adoption models including the users' individual IT culture as an antecedent or mediating variable. The instrument developed in the present study could lay the foundation for a new body of cumulative research in the IS field.

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**APPENDIX 1**

| Constructs  | Labels | Items n° | items  |
|---|--------|----------|--|
| <b>Situational / Contextual / Global IT needs</b> | ITNEE  | 1        | <p><i>This item is a multi choice question</i></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> <i>I do not need any IT</i></li> <li><input type="checkbox"/> <i>I need IT only for specific given tasks, a few or many, but not all my tasks in a given context.</i><br/><i>Examples given as indications. These examples are non exclusive and may be cumulative or not:</i> <ul style="list-style-type: none"> <li>- <i>need for specific softwares to do only some of my work tasks</i></li> <li>- <i>need for electronic mail to communicate</i></li> <li>- <i>need for the web to find movies time table</i></li> <li>- <i>need for the last video games console to play with a game that one finds interesting.</i></li> </ul> </li> <li><input type="checkbox"/> <i>I need IT globally in some contexts, in some "slides" of my life.</i><br/><i>Examples given as indications. These examples are non exclusive and may be cumulative or not:</i> <ul style="list-style-type: none"> <li>- <i>I need IT in my private life</i></li> <li>- <i>I need IT in order to do my job</i></li> <li>- <i>I need IT for my leisure time</i></li> </ul> </li> <li><input type="checkbox"/> <i>I need computers in all aspects of my life. I could perhaps do without it but it would be difficult and would create problems for me. IT has become an implicit part of my everyday life.</i></li> </ul> |

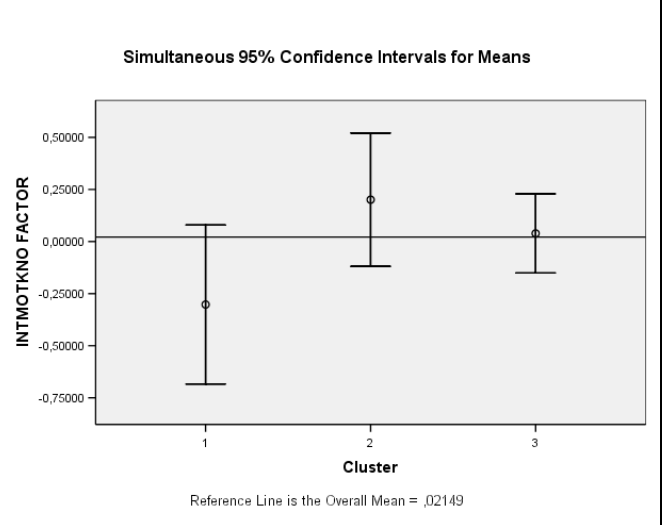
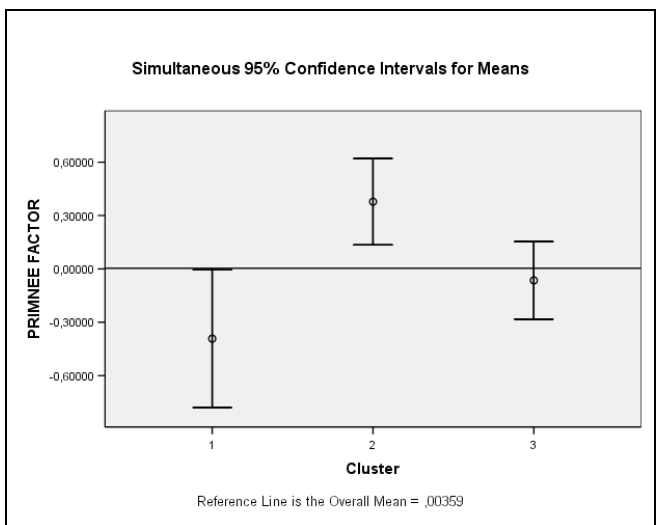
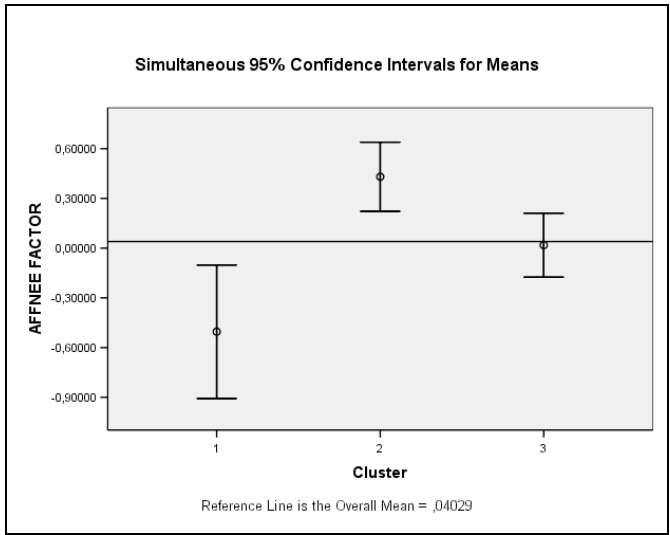
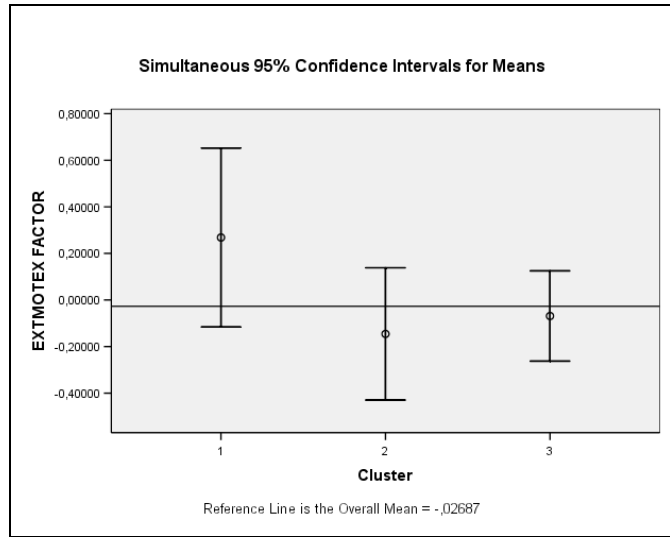
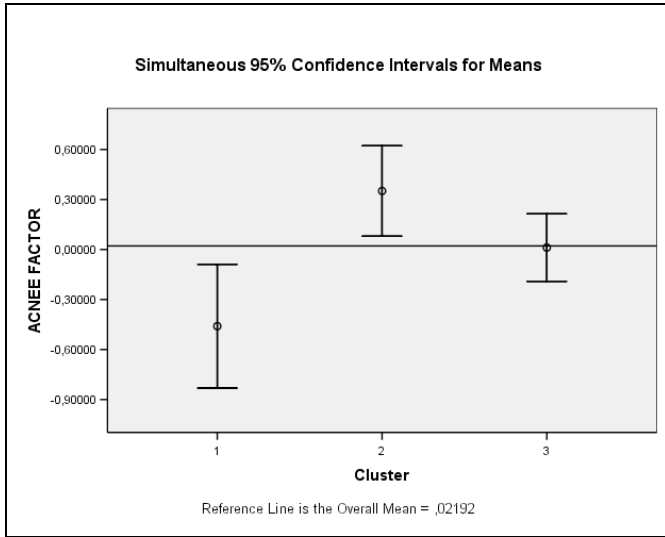
|   |            |    |   |
|---|------------|----|---|
| <b>Self accomplishment needs satisfied through the usage of IT</b>  | ACCNEE1    | 41 | <i>- I get satisfaction from improving my mastery of the software I use.<br/>                     - I like learning to use new software which could be useful to me..<br/>                     - I get satisfaction from mastering software that I use.<br/>                     - I like the feeling of being completely engrossed in new software</i>   |
|   | ACCNEE2    | 51 |   |
|   | ACCNEE3    | 42 |   |
|   | ACCNEE4    | 54 |   |
| <b>Extrinsic motivation to use IT through external regulation</b>   | EXTMOTEXT1 | 28 | <i>- I am obliged to use IT but it is tiresome for me.<br/>                     - I don't like computers but I am obliged to use them.<br/>                     - Using a computer is a constraint for me.<br/>                     - I only use a computer because the work I have to do obliges me to do so.</i>  |
|   | EXTMOTEXT2 | 34 |   |
|   | EXTMOTEXT3 | 53 |   |
|   | EXTMOTEXT4 | 25 |   |
| <b>Power needs satisfied through the usage of IT</b>                | POWNEE1    | 38 | <i>- I use IT because that allows me to be better considered by the people I know.<br/>                     - To be good with IT makes me more important with my entourage and I like that.<br/>                     - Being good with computers gives me a feeling of superiority<br/>                     - I get involved with computers because I want to be more highly valued by certain people.</i>              |
|   | POWNEE2    | 36 |   |
|   | POWNEE3    | 39 |   |
|   | POWNEE4    | 43 |   |
| <b>Affiliation needs satisfied through the usage of IT</b>          | AFFNEE1    | 2  | <i>- Having a computer allows me to keep in touch with my work group and/or with certain people in my entourage.<br/>                     - I need a computer to work and/or to communicate.<br/>                     - Using a computer allows me to exchange with my work colleagues and/or the people I like.</i>  |
|   | AFFNEE2    | 10 |   |
|   | AFFNEE3    | 17 |   |
| <b>Primary needs satisfied through the usage of IT</b>              | PRIMNEE2   | 31 | <i>- When I am using my computer, I don't notice the time going by and I have difficulty tearing myself away.<br/>                     - I have trouble controlling the time I spend on my computer.</i>  |
|   | PRIMNEE3   | 48 |   |
| <b>Intrinsic motivation to know through IT</b>                      | INTMOTKNO1 | 8  | <i>- I like discovering new software.<br/>                     - I like computers<br/>                     - I find some aspects of IT, entertaining.</i>   |
|   | INTMOTKNO2 | 7  |   |
|   | INTMOTKNO3 | 12 |   |
| <b>Extrinsic motivation to use IT through identified regulation</b> | EXTMOTID1  | 6  | <i>- Using a computer improves the quality of my work.<br/>                     - A computer is a work tool which allows me to be more productive and I think one should use this tool if one wants to be efficient.<br/>                     - I must use a computer if I want to do my work properly.<br/>                     - IT is a tool which allows me to undertake some tasks which I consider important.</i> |
|   | EXTMOTID2  | 29 |   |
|   | EXTMOTID3  | 40 |   |
|   | EXTMOTID4  | 52 |   |

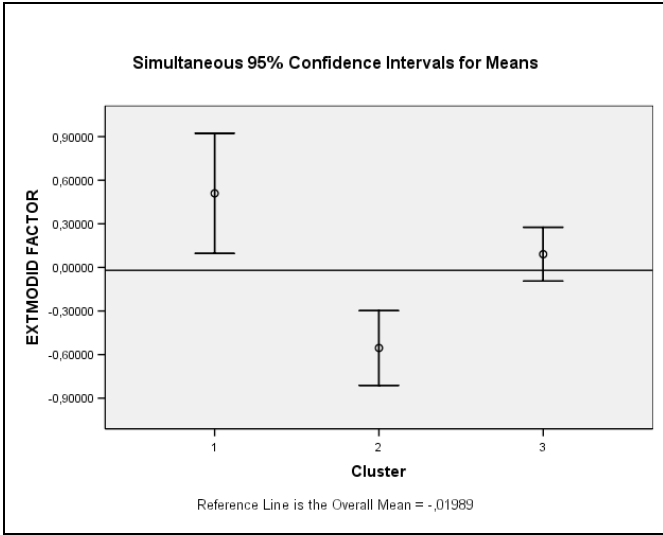
**APPENDIX 2: Cluster profiles. 2-step clusters**

| Centroids |            |                  |             |                 |                |               |             |               |             |                |             |      |
|-----------|------------|------------------|-------------|-----------------|----------------|---------------|-------------|---------------|-------------|----------------|-------------|------|
|           |            | ACNEE FACTOR     |             | EXTMOTEX FACTOR |                | POWNEE FACTOR |             | AFFNEE FACTOR |             | PRIMNEE FACTOR |             |      |
|           | Cluster N° | Mean             | Std. Deviat | Mean            | Std. Deviat    | Mean          | Std. Deviat | Mean          | Std. Deviat | Mean           | Std. Deviat |      |
|           | ITNEE=2    | 1                | 0,01        | 0,93            | - 0,07         | 0,89          | 0,04        | 0,93          | 0,02        | 0,88           | - 0,06      | 0,99 |
|           | ITNEE=4    | 2                | 0,35        | 0,93            | - 0,15         | 0,98          | - 0,23      | 1,14          | 0,43        | 0,72           | 0,38        | 0,83 |
|           | ITNEE=3    | 3                | - 0,50      | 1,03            | 0,32           | 1,14          | 0,23        | 0,91          | - 0,61      | 1,20           | - 0,42      | 1,04 |
|           | Combined   |                  | 0,01        | 0,99            | - 0,01         | 0,98          | - 0,00      | 1,00          | 0,01        | 0,98           | - 0,01      | 1,00 |
| Centroids |            |                  |             |                 |                |               |             |               |             |                |             |      |
|           |            | INTMOTKNO FACTOR |             | EXTMODID FACTOR |                |               |             |               |             |                |             |      |
|           | Cluster N° | Mean             | Std. Deviat | Mean            | Std. Deviation |               |             |               |             |                |             |      |
|           | ITNEE=2    | 1                | 0,04        | 0,87            | 0,09           | 0,85          |             |               |             |                |             |      |
|           | ITNEE=4    | 2                | 0,20        | 1,10            | - 0,55         | 0,88          |             |               |             |                |             |      |
|           | ITNEE=3    | 3                | - 0,36      | 1,06            | 0,56           | 1,14          |             |               |             |                |             |      |
|           | Combined   |                  | 0,01        | 0,99            | - 0,01         | 1,00          |             |               |             |                |             |      |



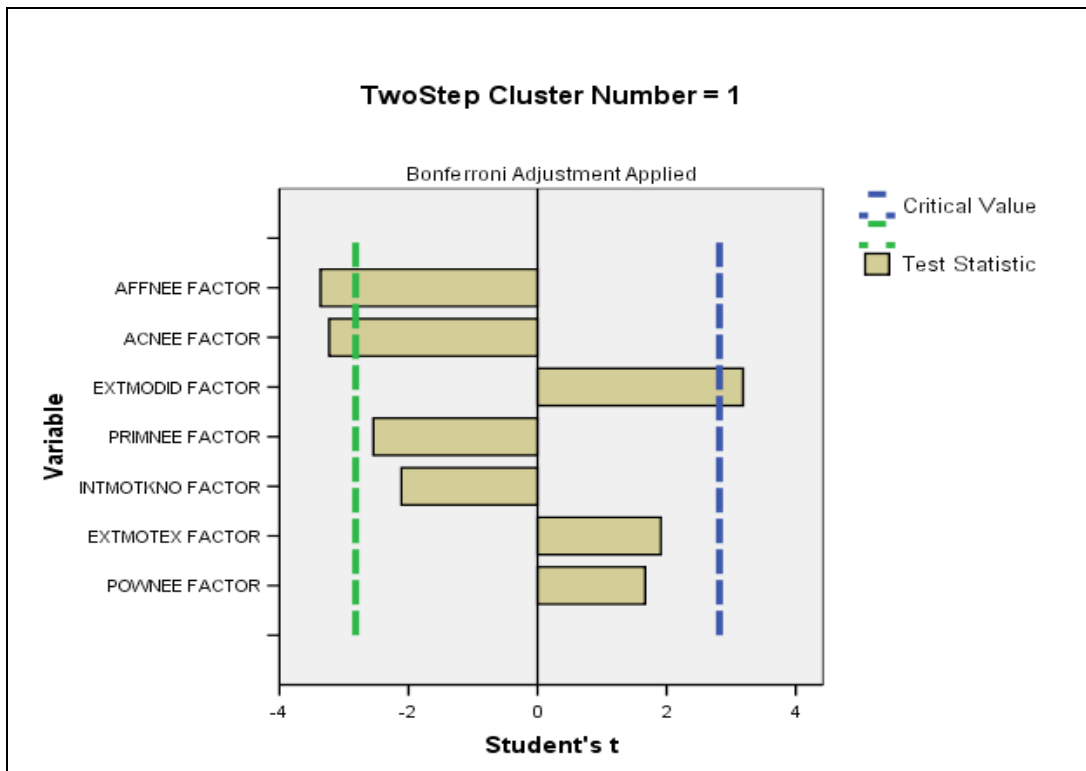
**APPENDIX 3 : Within cluster variations in two step clustering**

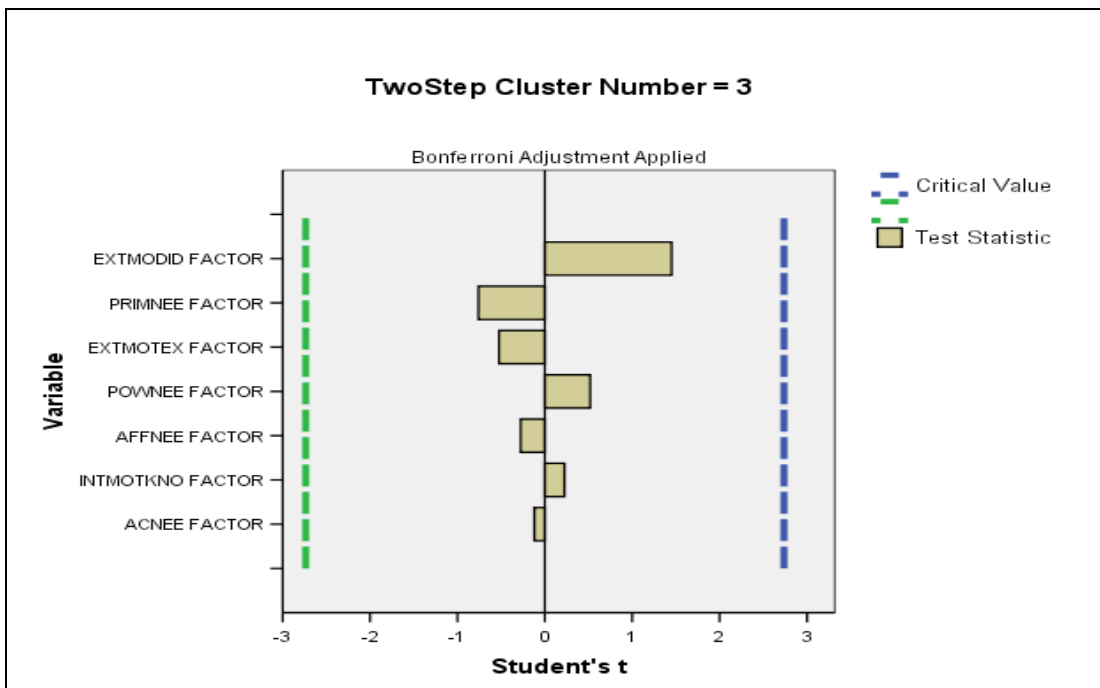
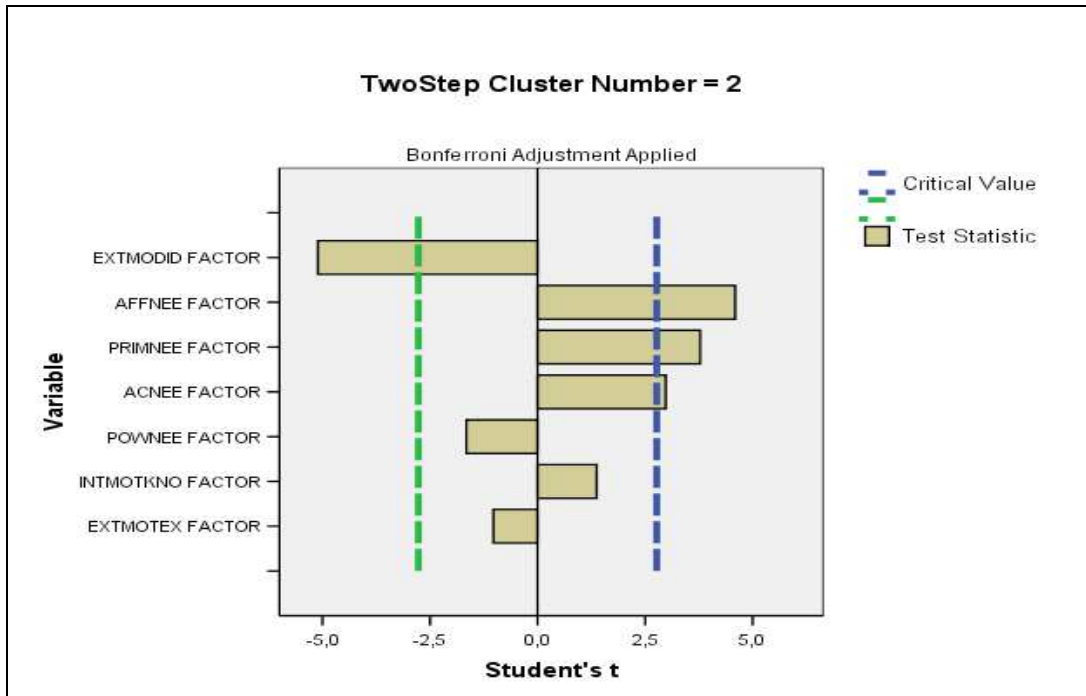




**APPENDIX 4: Variables importance in two step clustering**

Continuous variablewise importance





Categorical variablewise (ITNEE) importance

