

Leadership and Innovation in the Greek Secondary Education: A Structural Equation Model describes the term “innovation”

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Abstract

The Greek educational system is characterized by, primarily, centralized structure and, consecutively, unified planning and central control. This study focuses on the innovative actions that the head teachers in the Greek Secondary education system could undertake and discuss two theoretical hypotheses that may explain head teachers' opinions towards school possibilities to implement outstanding innovative actions. A serious obstacle seems to be the university entrance exams at the 12ed grade of high school because both students and teachers are focused towards them. A test and semi-structure interviews were used to gather data from 121 head teachers of Secondary Education in Greece. The interviews are studied, categorized and analysed by the help of Structural equations in order to comprise valuable conclusions. The Structural equation modelling analysis showed A second-order (CFA) model based on the assumption that all statements of the semi-structure interviews load on nine first-order factors and on tree second-order factors concerning the head teachers views in relation to the term “Inovation”. Implications for further research are also had made.

Literature Review

Johnson et al. (2008) stated that teacher leaders need support to overcome stubborn barriers created by the norms of school culture—autonomy, egalitarianism, and deference to seniority. A growing number of researchers and practitioners believe that leadership in education, and in particular how that leadership is defined and practiced, may well become a determining factor in the success or failure of public education. One response to this growing concern has been a mushrooming of leadership training programs, the creation of new leadership institutes and academies, proposals for standards of leadership, and specialized coaching and mentoring programs, along with a new spate of research on what it takes to lead the schools we need (Phillips et al.,). Goldberg (2001) work reflecting on 43 interviews with eminent educational leaders from all backgrounds and political stripes, the author isolates five common characteristics: a bedrock belief in their work's usefulness, courage to swim upstream on behalf of their beliefs, possession of a social conscience, seriousness of purpose, and situational mastery. Ioordanidis (2004) stated that according to the literature ‘innovation is the adoption of an internally generated or purchased device, system, policy, program, process, product or service that is new to the adopting organization (Damanpour, 1991; Daft, 1982, Damanpour and Evan, 1984)

Moreover, innovation is the ‘process through which an individual or other decision-maker unit, passes from the first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to the implementation of the new idea and to the confirmation of this decision’ (Rogers, 1984) In the school context (Stoner and Freeman, 1992, Griffin, 1987, Damanpour, 1987) three basic categories of innovations are distinguished (Giannakaki, 2005): 1) educational – pedagogic innovation, 2) administrative – organisational innovation, 3) innovation regarding in the school climate and the human relations. At the last 20 years, at least, the significance of innovation was recognized as a characteristic of important priority for the educational systems and school The meaning and the importance of innovation and application of innovations in education varies depending on the educational system and the country. In Greece as in other countries with similar administrative systems of education and school units the conception and the application of innovations acquire a particular dimension because of the centralized system of administration and its bureaucratic characteristics. Ioordanidis et Anastasiadou in the 2007 Conference of the British Educational Leadership, Management & Administration Society mentioned that in Greece as in other countries with similar administrative systems of education and school units the conception and the application of innovations acquire a particular dimension because of the centralized system of administration and its bureaucratic characteristics (Ioordanidis et Anastasiadou, 2007).

Purpose of the project

The Greek educational system is characterized by, primarily, centralized structure and, consecutively, unified planning and central control.

This study focuses on the innovative actions that the head teachers in the Greek Secondary education system could undertake and discuss two theoretical hypotheses that may explain head teachers' opinions towards school possibilities to implement outstanding innovative actions. In particular this research examines the views of head teacher on the definition of the term "innovation" because they are the ones that the successful implementation of any innovation in the school relayed on them and lead the rest of the teachers to apply any advance action.

Methodology-Sample population

A test and semi-structure interviews were used to gather data from 121 head teachers of Secondary Education in Greece during the academic year 2005-06 and 630 references in relation to the term "Innovation" were gathered as it appeared in Iordanidis and Anastasiadou work (Iordanidis et Anastasiadou, 2007). The written texts after the interview were examined on the basis of *Quantitative and Qualitative Content Analysis*, which, according to Berelson (1971²), enables investigating views and perceptions of specific individuals or groups. A different view is offered by De Sola Pool (1959), who claims that such an analysis is ideal for studying meanings and semiotic relations involved in written or spoken speech. Later, Palmquist (1990) employs Content Analysis in written texts produced by students and teachers. The representatives of the French school, by employing the conventional thematic analysis, offer a different outlook to the specific method, re-modeling both its methodology and potential. A basic principle of the analysis is identifying and collecting the units of the research material, which comprise a message (Moscovici 1970; Mucchieli 1988).

In other words, the specific analysis groups the components of the research data into thematic categories in relation to their meaning, and, subsequently, calculates and analyzes them accordingly. Significantly, the analysis also enables investigating the absence of certain themes, since it is suggestive of the aspects that are investigated, always in relation to the research objectives. The themes were established as the analysis units and were analyzed in four basic categories, comprising subcategories, as ensued by the data (Lasswell & Leites 1965; Veron 1981; Bardin 1977; Grawitz 1981). The number of the sample population (630 references) is much bigger over 200, which is considered a large number according to Kline (1998) for the techniques of structural equation modelling.

Three proposed models

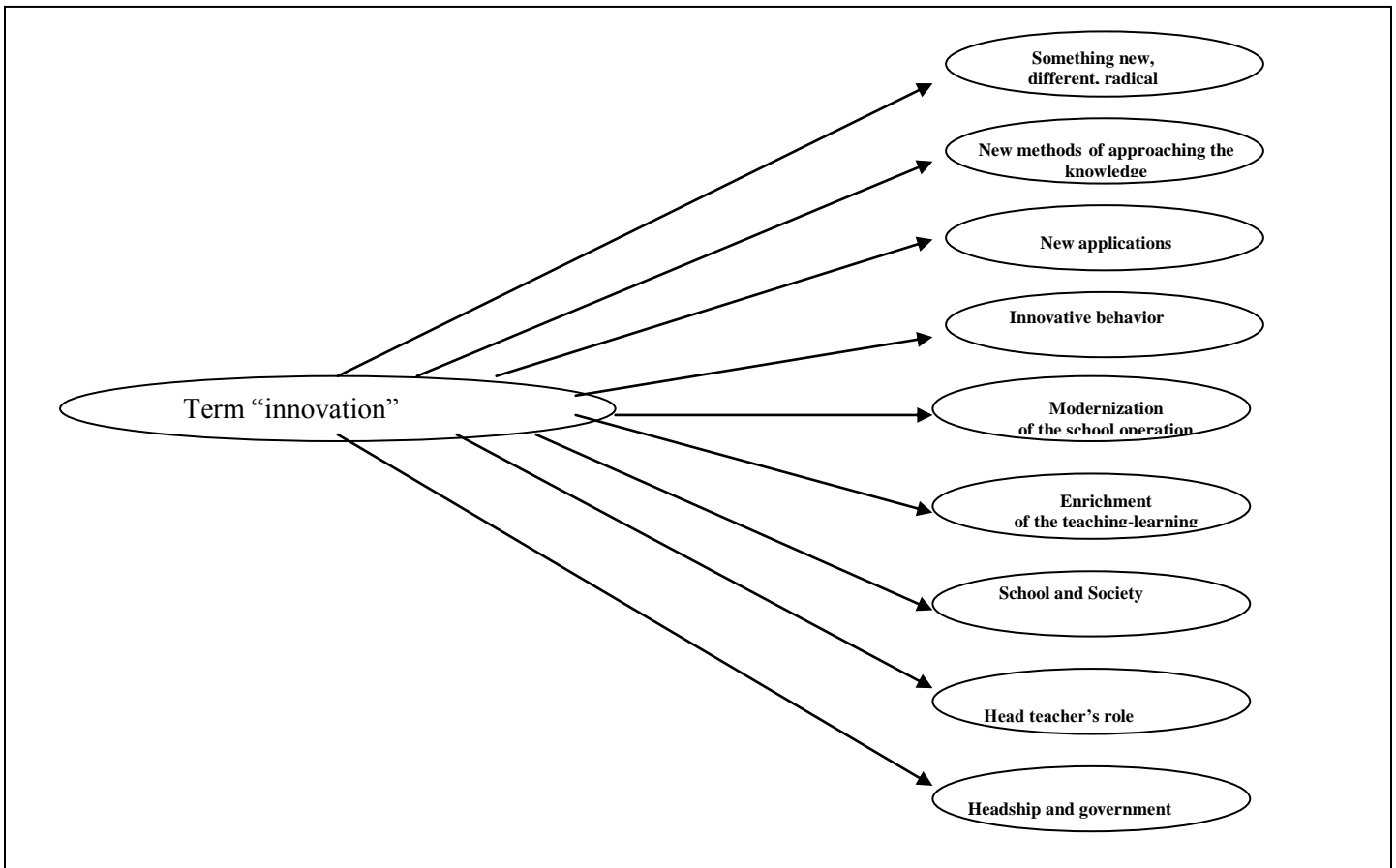


Figure 1: Model 2

Three models differing in terms of their structure were examined in the framework of this project, namely model 1, model 2 and model 3. Model 1 is based on the assumption that all statements-references of the questionnaire load on a first-order factor (first order CFA model) concerning the references in relation to the definition of the term “Innovation” Model 2 (second order CFA model) is based on the assumption that all statements-references of the questionnaire load on nine first-order factors (latent variables) and one second-order factors (latent variables) concerning the definition the term “innovation” that the one hundred head teachers gave (Figure 1). More specifically, following the analysis of the content of the statements included in the tool, there was an examination of the loadings of variables-references on nine first-order factors. The first first-order factor concerns the definition of the questioned term as something new, something different, and something radical. The second first-order factor concerns the definition of the questioned term as the new methods of approaching the knowledge and the teaching process.

The third and four first-order factor concern the definition of the questioned term as new applications and the Innovative behavior respectively. The following tree first-order factors concern Modernization of the school operation, School and Society The following first-order factor comprises the statements that refer to the *Headteacher’s role*. Loading on the last first-order factor are the statements concerning the *Headship and government*.

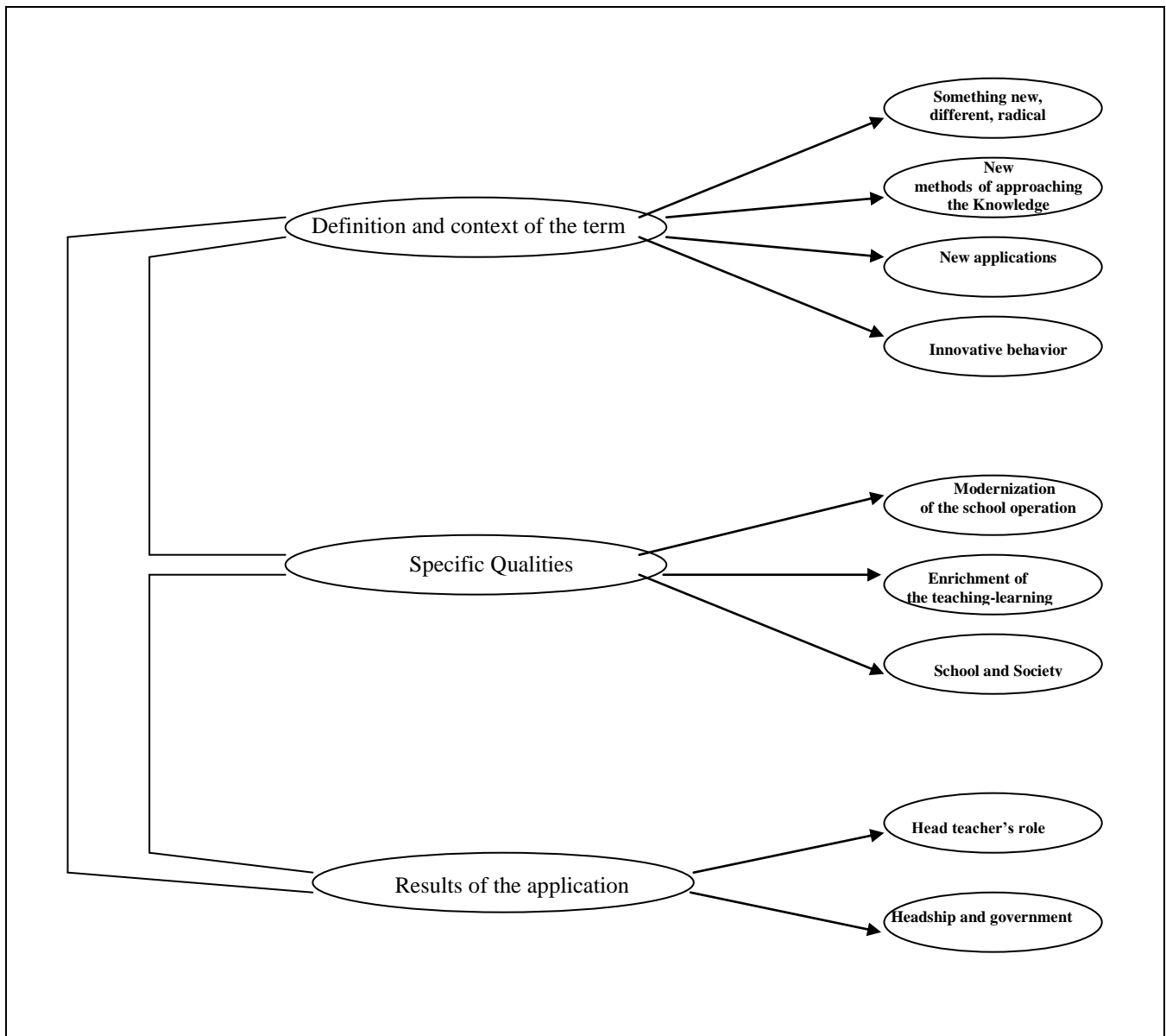


Figure 1: Model 3

Model 3 (second-order CFA model) is based on the assumption that all statements of the questionnaire load on nine first-order factors (latent variables) and on three second-order factors (latent variables) concerning the head teachers views (Figure 2). More specifically, Something new, something different, something radical, New methods of approaching the knowledge and the teaching process, New applications, Innovative behavior along with the corresponding statements as they were presented under model 2, load on the second-order factor concerning the Definition and context of the term. The first-order factors including Modernization of the school operation, Enrichment of the teaching-learning process, School and Society factors with the corresponding statements, as they are referred to under model 2, load on the second-order factor concerning the Specific Qualities. Finally, the first-order factors including Head teacher's role and Headship and government factors with the corresponding statements, as they are referred to under model 2, load on the second-order factor concerning the Results of the application

Confirmatory factor analysis – Structural equation modelling

In order to explore the structure of the factors that were measured through the questionnaire, Confirmatory Factor Analysis (CFA) in the form of structural equation modelling was applied to the data, which was followed by efforts to develop a model that shows the connection between the various factors, and more specifically, the connection between the observed variables and factors. The aim of this confirmatory analysis was to reveal whether the questionnaire was in fact reliable and suitable for measuring the variables it examines. It should be noted that an assessment instrument is considered to have construct validity if the existence of every disparity in its statements can be explained (Anastasiadou et al., 2006).

- In confirmatory factor analysis a covariance matrix is created with the data, which is compared to a hypothetical one referred to under the theoretical model.
- Confirmatory factor analysis examines whether the data confirm the theoretical model.
- The whole process allows for the structure of the factors to be more influenced by theory than by mathematical calculations.
- The process provides us with statistical adjustment criteria, which are better than subjective assessments that rely on empirical rules.
- The confirmatory method is based on the assumption that observed variables can be expressed as a linear combination of certain immeasurable common variables, which are known as latent variables-factors. For every observed variable, the structural equation determines the latent variables that interpret its variance and residual variance, which cannot be interpreted by them.
- Confirmatory analysis determines part of the variance of every variable, which can be explained by all those factors that are connected by it, and their relationship is presented in the form of a structural equation.
- Confirmatory analysis allows for the ranking between variables.
- The structural equation model arising from the confirmatory analysis can be depicted in the form of a graph. Observed variables are represented by a rectangle or square, and latent variables-factors by circles or ellipses. The one-way arrows indicate the existence of a linear relationship from the latent variables to the observations, or among the latent variables, whereas the two-way arrows present the covariance of the latent variables.
- The loading of the factor on the variable is written numerically on the arrows. Additionally, the arrows pointing towards the variables include the residuals.
- It is noted that the criteria for the acceptance of a model include the CFI (CFI=comparative fit index, which is independent of the size of the sample and takes on a value from 0 to 1) (Bentler, 1993, Joreskog et al., 1996) and the following must apply concurrently: $CFI \geq 0.9$, the X^2/df index (X^2/df =chi-square to its degrees of freedom ratio), as well as $X^2/df < 2$. Seeing as cause X^2/df depends on the size of the sample, use is made of the NNFI (Non-Normed Fit Index, which is independent of the size of the sample) (Bentler et al., 1980), and $NNFI > 0.95$ must apply concurrently. Also, the RMSR indices (Root Mean Square Residuals) are used and the following must apply concurrently: $RMSR < 0.06$ and $RMSEA < 0.06$ ($RMSEA$ =root mean-square error of approximation), as well as $RMSEA < 0.06$.

For the purposes of data analysis, the multivariate normality of all variables participating in the analysis was tested, and it was ascertained that all of the univariate distributions are normal, all the joint distributions of all variable combinations are also normal, all the bivariate scatter plots are linear and uniformly scattered, and lastly, there are no outliers.

Results

Results and Analysis of Themes: The elements of analysis of data of head teachers showed that the head teachers wrote freely relatively big texts with 630 globally references. In Table 1 are presented the categories of references and their rate of appearance as it appeared in Iordanidis and Anastasiadou work (Iordanidis et Anastasiadou, 2007).

Table 1: Thematic categories of the term “Innovation”

Thematic categories	N	%
1. Definition and context of the term	278	44.13%
1.1. Something new, something different, something radical	117	18.57%
1.2. New methods of approaching the knowledge and the teaching	85	13.49%
1.3. New applications	47	7.47%
1.4. Innovative behavior	29	4.6%
2. Specific Qualities	186	29.52%
2.1. Modernization of the school operation	83	13.17%
2.2. Enrichment of the teaching-learning process	54	8.57%
2.3 School and Society	49	7.78%
3. Results of the application	166	26.35%
3.1. Head teacher's role	92	14.6%
3.2. Headship and government	74	11.75%

1. Definition and context of the term

In the thematic this are recorded the reports-references that are related with the content of term “Innovations” and are reported in new, different and radical methods of approach of knowledge and teaching, in the practices and in the behaviors.

1.1. Something new, something different, something radical

The reports of texts, that raise in this category are enough and they exist cases where the head teachers dedicate a very big department of text so that they describe their opinions toward to new, different, radical that they attribute in the term “Innovations”. More specifically, “Innovations” in the school he is each which new that is applied, initiatives that are developed, free intellectual searches that they feel, thoughts radical that are shaped, changes that are realized, drawings action that relished, perceptions that are revised, institutions that are renewed.

1.2. Enrichment of the teaching-learning process

It is observed that the “Innovations” involve the application of new methods of approach of knowledge that escapes from the traditional way of teaching, the possibility of teacher of taking into consideration his the new school data, and of escaping the indications from the books of schoolteacher. With similar way, in the texts of directors the “Innovations” are those that guide the teachers to apply new methods of teaching, to make new approaches in the analytic program and the matter of courses and finally, to escape from stereotyped instructive models and to approach or with the methodology project or the [diathematikotita] or [omadosynergatiki] teaching the training process with positive results for the school unit.

1.3. New applications

In this category, the head teachers connect the significance “Innovations” with certain energies, certain processes and practices that bring the teachers in the school approaches that are completely new and that has not been applied in the past.

1.4. Innovative behavior

The term “Innovations” does not only encompass methods of teaching and learning but is also expressed with terms of behavior. Innovations are anything escapes from the limits of stereotyped behavior, traditional way of thought, reason and action.

2. Specific Qualities

In the thematic this are recorded the reports, that are related with qualities of term “Innovations” and his results and that are reported so much in the modernization of operation of school unit, in the enrichment of process of teaching what in the relation of school with the wider society.

2.1. Modernization of the school operation

In this category, the directors connect the significance “Innovations” with all those institutions and the action that connect the Greek school with the modern developments rendering capable to follow these developments,

the flexible, creative, cheerful, in permanent contact with the society of knowledge, technology and the multiculturalism.

2.2. Enrichment of the teaching-learning process

In the texts it is recorded that “Innovations” it means disengagement from the “traditional” teaching and reduction in other level of teaching based on the self-activity and [biomatikotita]”. It is pointed out that the innovative programs promote the educational process and lead the learning to easy streets and through them is given the possibility in the students react by themselves, of activating itself, of experiencing various situations, of developing their critical faculty, of acquiring more knowledge that will lead to the substantiation of learning.

2.3. School and Society

It is observed that the “Innovations” involve the effort of state to render the school in the center of interest. A school that is able opens his windows in real socially events in progress, in the real problems, a school [apoperithoriopoiimeno], and finally a school open in the society that will develop the school potential collaborating with various social and institutional institutions.

3. Results of the application

In the thematic this are recorded the reports that are related with the conditions of application of innovations with regard to the director and the State.

3.1. Head teacher’s role

The definition on one side concerns in the faculty of head teacher with base the various parameters the non-existence of which seated from impossible until unfeasible the application of innovations in the school unit. The “innovations” are connected unbreakably with the freedom and flexibility of movements of head teachers to program them.

3.2. Headship and government

The application of Innovations encompasses the combination of Address of School and State. Capable and necessary treaty on the application of innovations is their financing from the state and the existence of modern infrastructures. The head teachers however, declare so much the non-existence of infrastructures that would encourage the application of innovations, briefing, training, financing, projection.

Results

In the first model there was the assumption that all the statements of the questionnaire load on one first-order factor (first order CFA model) concerning the references in relation to definition of the term “Innovation”. This model did not present goodness of fit to the data (Table 1). (CFI =0.88, X²/df =2.2, NNFI=0.62, RMSR=0.08, RMSEA=0.07).

Πίνακας 1: Good fit indexes

	model 1	model 2	model 3
CFI	0.87	0.92	0.98
X ² /df	2.2	1.86	1.43
NNFI	0.62	0.97	0.98
RMSR	0.08	0.007	0.005
RMSEA	0.07	0.001	0.004

Both of the following models, namely model 2 and 3, provide a good explanation of the data since the corresponding CFI are greater than the limit of 0.9, and the corresponding X²/df are lower than 2. Model 3 (Figure 2) provides a better explanation than Model 2 (Figure 1) with regard to the structure of the definitions and meanings of the examined term between the indices and the latent structures, since the CFI goodness of fit index in Model 3 is greater than that of Model 2, and the X²/df index in Model 3 is lower than that of Model 2.

Reliability of Model 3

Cronbach’s α (reliability index) was 0.8121 for the factor concerning the Definition and context of the term, 0.7097 for the factor concerning the Specific Qualities, and 0.6837 for the factor concerning the Results of the application, all of which are satisfactory. Cronbach’s α (reliability index) concerning all of the statements of the questionnaire was 0.7435, which is also satisfactory.

Conclusions

This project aimed at exploring the meaning that secondary education head teachers give to the term “Innovation” in a semi- structure interview. The Structural equation modelling analysis showed a second-order (CFA) model based on the assumption that all statements of the semi-structure interviews load on nine first-order factors which are the Something new, something different, New methods of approaching the knowledge and the teaching something radical, New applications, Innovative behavior, Modernization of the school operation, Enrichment of the teaching-learning process, School and Society, Head teacher’s role, Headship and government factors, and on tree second-order factors concerning the head teachers views in relation to the term “Innovation” which are the Definition and context of the term factor, the Specific Qualities factor, Results of the application factor.

Suggestion for further research

As each other empiric research and concrete is not without restrictions: the research can be strengthened they are increased the size of sample and including asked in other schools that are emanated from different geographic regions and. With bigger sample a more regular research can realise. Also it would be interest it is examined [an] the directors/[tries] are sold they adopt new innovators instructive practical and who it would be the most advisable instructive methodology. With base the results of research a important inquiring question is caused: That the education can help the directors to comprehend the conceptual determination of significance “Innovation”. Would be useful this question it is investigated in future research.

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