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Social Engineering Theory: A Model for the Appropriation of Innovations with a Case Study of the Health MDGs

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1. Introduction

How do you get would-be mothers in tropical Africa to understand the importance of a life-saving innovation in science and technology like the use of impregnated mosquito nets to ward off deadly mosquito bites and so, reduce the rate of infant and maternal mortality? How do you get someone fettered by chains of ancestral traditional beliefs or bugged down by an excessive dose of brain washing (from whatever source) to change from consolidated negative attitudes to a positive attitude to innovative ideas and innovations desirable and beneficial to an emergent economy in the age of globalisation? How does one convince belligerent parties in a civil war or on a war path that there is a possible peaceful conciliatory solution to the conflict and they have an interest in being part of the solution and not part of the problem? How can we bring about a desired and salutary **change of mindset** so that a refractory colonial mentality can be replaced by a post-colonial mindset receptive to new and lofty ideals of participatory democracy, good governance and socio-economico-political change? The answer is probably **social engineering** through **attitude engineering** of some sort.

‘Probably’ because the correct answer, at this point, is really **‘I wish we knew exactly how!’** What is certain, however, is that the frustrations currently experienced by Governments, Development Agencies of the United Nations system, Civil Society Organisations (CSOs) and Non-governmental organisations (NGOs) who find their putatively sound ideas and technologies rejected or spurned by target populations will reduce with a better understanding of what **appropriation** really entails. The poor results and below- expectation rates of implementation and slow progress in the attainment of development goals will reduce considerably if and when a solution is found to the problem of **effective adoption and appropriation** of development oriented **innovations**.

Although the world development agenda recognises **innovation** as a fundamental necessity in the development enterprise, the fundamental question in the implementation of the use of innovative technology by target populations is seldom asked. That question, in my considered opinion is, **‘how does one get the target population to consider, accept, and adopt or appropriate an innovation?’** As indicated above, those who have attempted to ask

the question seem to have considered awareness or sensitisation campaigns to be the answer with the result that UN and governments have together with NGOs spent huge amounts of resources on *awareness campaigns* with varying results. In some cases, there is no commensurate measurable impact to justify the enormous resources spent on awareness campaigns. It is therefore important to better understand what is involved in **appropriation** since this holds promise for, *inter alia*, improving the implementation of the MDGs and other development initiatives crucially relevant to the process of social and economic transformation in the enterprise of national development. There is a need to institute a culture of the **effective use** of innovations in development endeavours in terms of appropriation or adoption of new and innovative ideas that constitute solutions to identified problems.

1.1 Research problem

In human interaction, accepting new ideas is not automatic. New ideas may meet with doubts, scepticism or apathy from the target audience and may ultimately receive a general disapproval, refusal or rejection which may be overt or covert, direct or indirect, veiled or unveiled. Faced with a novelty, reactions from interlocutors may vary from positive to negative, sometimes going through a neutral state of voluntary or involuntary indecision. The variation in attitudes and behaviours towards new ideas and new technologies from positive to negative is a fact of social reality irrespective of the validity, veracity or scientificity of the innovation. This state of affairs becomes critical and galling when evidence-based scientific and technological innovations in science and technology crucially relevant for personal and public health, food security, poverty reduction and national development are rejected by a preponderance of negative attitudes and negative responses from the targeted communities. Nowhere is this more evident than in the implementation of the millennium development goals (MDGs) in Africa and some areas of Latin America. The Global Monitoring Report (GMR) of the World Bank shows (with abundant statistics) that *“Sub-Saharan Africa lags behind on all MDGs including the goal for poverty reduction, though many countries in the region are now experiencing improved growth performance (GMR 2008:3)... On current trends, most African countries are off track to meet most of the MDGs”* (GMR 2008: 20-21). It has been shown that beyond glaring economic factors responsible for this state of affairs in part, the implementation of innovations in the enterprise of national development is hampered by socio-cultural factors and language and communication factors which negatively influence the rate and especially the degree of appropriation of innovations (See Chumbow 2009, 2010 and Bodomo 1997 among others).

A study of the implementation of the Health MDGs (reduction of infant and maternal mortality, reduction of the incidence of HIV/AIDs and ‘roll back malaria’) in Cameroon shows that there was an overall reduction of less than 2% in five years from 2001-2006, despite the Ministry of Health’s efforts on awareness campaigns by teams of field workers armed with information guidelines to the population (Kayum 2012). This raises the fundamental question ‘what does it take for innovations to be effectively appropriated by the target population?’ This paper situates and elucidates this and related questions, squarely in the domain of **social engineering** as an Applied Social Science by proposing a model of appropriation informed by previous works and experience.

2. Social engineering and relevant concepts

The definition and clarification, in this section, of concepts such as **social engineering, awareness, innovations, attitude, appropriation and mindset (change)** will inform subsequent discussions of the issues relevant to the proposed model.

2.1 Social engineering

Social Engineering is the application of principles, techniques, methods and findings of social sciences to the solution of identified social problems, especially with respect to effecting change. Thus, social engineering concerns for example, the application of Karl Popper's 1945 methods of 'critical rationalism' in science to the problems of the 'open society'. **Social Engineering** is therefore an **Applied Social Science** in that knowledge in science is used to solve societal problems in the same way that knowledge of Mathematics, Physics etc. is used to solve problems in the domain of Engineering and knowledge of Biology and Chemistry used to solve health problems in the field of Medicine or Pharmacy.

From all considerations, a **social engineer** is one who tries to influence popular attitudes, social behaviours, and resource management on a large scale. Social engineering is the application of the scientific method for social concern. In other words, social engineers use the objective and principled methods of science to dissect, analyse, synthesize and understand social systems, so as to arrive at appropriate decisions from the view point of scientists, rather than as politicians. Thus, the major difference between politicians and social engineers is that scientists base decisions on careful evaluations and objectivity without differential advantage.

Concretely, the practice of social engineering as an **applied science** requires determining (by way of objective, scientific method or critical rationalism) certain 'engineering' specifications as ultimate values or ideal targets that must be met by individuals or collectivity/society and then proceeding to an orientation of attitudes and behaviours of individuals or groups in the direction of the desired specifications.

It is noteworthy that the term social engineering is polysemic in that it has other meanings and pejorative connotations. Social engineering in an entirely different meaning or semantic reading refers to *technological fraud*, such as internet scam, hacking tactics, etc. with an abundance of literature and scholarship on the subject. Secondly, a pejorative connotation is often introduced by some in the use of the term '**social engineering**' by considering the enterprise as a '**manipulation**' of individuals and/or groups to adopt alien attitudes and behaviours. However, Social Engineering as an applied social science, the object of the discussion in this chapter has nothing to do with these two derogatory concepts or shades of meaning.

The second reading of social engineering with the pejorative connotation of 'manipulation' may correctly describe and underscore observed practices involving the misuse of social engineering theory and practice. All engineering involves manipulation of some sort. However, manipulation to serve selfish interests, making individuals and society victims rather than beneficiaries of the social engineering process would, in the context of genuine social engineering, be a case of **malpractice**. Thus, the existence of such cases does not, to

my mind, militate against the emergence of a genuine social engineering theory and practice but simply underscores the need (as in the case of other applied sciences e.g. medicine), for the concomitant development of a code of ethics or a viable deontology of social engineering that will regulate both research and practice of social engineering to stigmatize and outlaw social engineering malpractice.

2.2 Awareness

Awareness is the perception or consciousness of some reality (concrete or abstract). Awareness, in other words, is thus the state or ability to perceive, to feel or to be conscious of events, objects or sensory patterns. Awareness, as a level of consciousness comes across as one where sense data can be confirmed by an observer without necessarily implying understanding. Awareness, according to the Oxford dictionary, is a 'state of elementary undifferentiated consciousness (<http://www.oxforddictionaries.com>). This, in effect, means that **awareness** can be overt or covert (subconscious) in the sense of knowing something without knowing it. Efforts to describe consciousness in neurological terms have focused on describing networks in the brain that develop awareness of the *qualia* developed by other networks. Interesting details of the biological (neuro-physiological) correlates of consciousness are not crucially relevant to this work. In ordinary language use, **awareness** may refer to the public or common knowledge (perception) of a social or political issue such as 'AIDS awareness', 'multicultural awareness', etc. **Awareness movements** proliferate in the form of Civil Society Organizations (CSOs) financed and encouraged by the consideration of **awareness** as an important factor in the solution of and mitigation of social ills and political problems. But to what extent is awareness a solution to social problems?

2.3 Innovation

'Innovation systems,' techno poles and technological parks constitute a significant pillar for the development of and propagation of science and technology in the present era of knowledge economies and knowledge societies (Chumbow 2011b). However, innovation in this paper refers to **the creation of new knowledge and better or more effective ideas, products, processes and technologies that are acceptable to society or government; more specifically, new knowledge in science and technology that is potentially beneficial to the community**. Innovations derive their pre-eminent value from their problem-solving capability and the possibility of effecting positive change, enhancing quality, efficiency, productivity and providing a competitive advantage. The competitive edge characteristic of innovations may be in the form of reduction of labour cost and environmental damage, or achievement of low energy consumption, etc.

2.4 Appropriation

This again is a polysemic word with many semantic readings or meanings and definitions. Appropriation may be envisaged as the process of taking possession of ideas principles, techniques or technologies or assigning renewed purpose to properties in knowledge, science and technology. The key words here are '*taking possession of*' (taking possession of something that is new and foreign). This definition is appropriate but not adequate. It does not go far enough to elucidate and illuminate the concept of appropriation. Indeed, what does

appropriation entail? Put differently, (in terms of our initial research question above) 'how does the target audience or population consider, accept, adopt and possess (or appropriate) the innovation? This work will contribute to answering this important question.

2.5 Attitude

Attitude is a well-known concept in the social sciences in general and in psychology in particular. The term takes a variety of different shades of meanings depending on whether one is in clinical psychology, social psychology or educational psychology, etc. (See for instance, Gardner 1984). However, the various semantic readings have a common core of shared features. From the literature we provide below a *practical definition* which highlights fundamental properties of 'attitude' derived from theories as experienced and practiced by psychologists, and other social and applied scientists.

Attitude is a propensity, predisposition or tendency to respond positively or negatively towards a certain idea, object, person or situation. Implicit in this definition is the fact that attitude influences an individual's choice of action and responses to stimuli (challenges, incentives, and rewards). Four major components or dimension of attitude are **affective** (emotions or feelings), **cognitive** (beliefs or opinions held consciously), **conative** (inclination for action) and **evaluative** (positive or negative response to stimuli). **Attitude according to some psychologists is a readiness or predisposition of a psyche to act in a certain way** (See, for instance, Carl Jung [1921] (1971). Attitude is therefore a psychological construct that represents an individual's degree of like or dislike for something. For Jung, these reactions are binary and come in pairs. They may be conscious or unconscious, implicit or explicit, rational or irrational, extraversions or introversions, etc.

2.6 Mindset

A mindset is a set of established assumptions, methods or notions held by one or more people or groups of people that determine their action and compel them to think and act in line with, or adopt and accept prior behaviour choices or tools. A mindset can thus be envisaged as a fixed mental attitude or disposition that determines a person's responses to and interpretation of situations

Clearly therefore, the key qualitative terms in the characterization of mindset are '**established**' and '**fixed**'. While attitudes are virtual predispositions in a state of **effervescence**, a mindset is a disposition that has crystallized and hence is fixed and established.

Ultimately, the task of social engineering as an applied social science with the rights, privileges and responsibilities of an applied science, is to cope with the challenge of **change of mindset** in a direction that is desirable, beneficial to the individual(s) and morally appropriate. In the age of knowledge economy, **mindset change** should not be and can no longer be the wishful thinking speculations of populist writers of 'success' books, but the object and subject of scientific investigation and empirical evidence predicated on a worthwhile theory or model. That is the task to which we have sought to place a stone for the edifice, that is the task to which social scientists of various disciplines and persuasions are called upon to contribute.

3. Model of innovation appropriation

3.1 Presentation of the model

The implementation of any innovation (for instance within the MDGs) involves new (scientific) knowledge and new technologies that have to be evaluated, understood, accepted and adopted as well as new ideas (often at variance with the culture and traditions of the people) that must be apprehended, comprehended and appropriated. Within this context, **innovations**, as already mentioned, are conceived of as the avalanche of new ideas, new knowledge and technologies that local communities have to cope with in the development process. The key issues in the implementation of a policy that entails adoption of an innovation are encapsulated in the following questions: How is the innovation to be conveyed to the masses of the rural population? How is comprehension of the innovation, its consequences and impact to be ensured? How does the innovation take root in the minds, in the hearts and in the lives of the people? In other words, how does the process effect a change of attitude, change of behaviour and/ or change of mind or mindset ?

In table 1 below, we present, motivate and discuss a design model of appropriation of innovations. The design benefits from some ideas of Cooper 1989 and Krashen 1981 and from our observations in the domain (Chumbow 1987, 1990, 2005, 2008, 2009, 2010). The six stages of the model underscore the fact that **the appropriation of an innovation is not an**

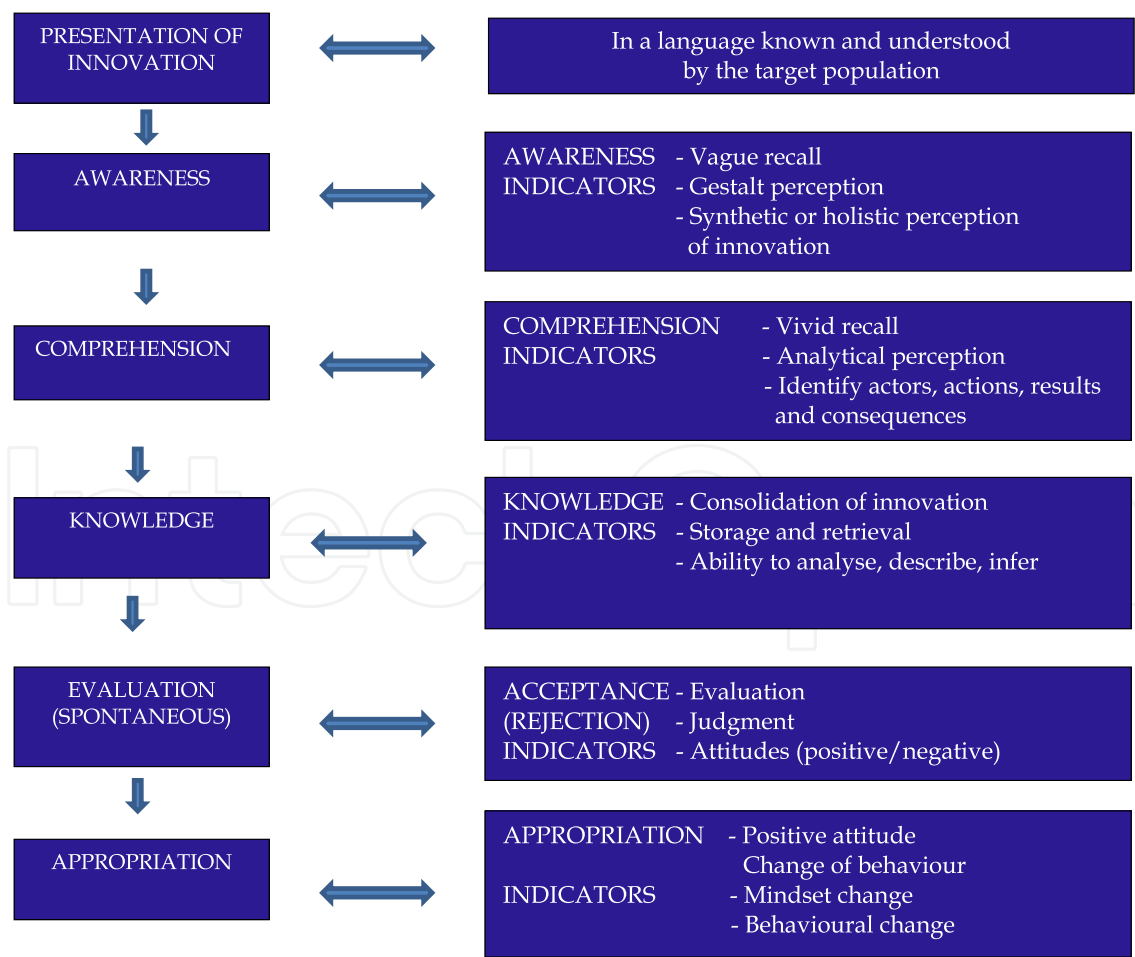


Table 1. A model for the innovation appropriation process.

event but a process that starts with the presentation of the innovation as **comprehensible input** in a language medium best understood by the target population and goes through varying phases from **awareness** of the innovation through, **comprehension, knowledge, spontaneous judgement** (evaluation), to adoption or appropriation. Each of these stages will be discussed in detail, each with a compendium of indicators postulated for each stage to characterise the stage and enable anyone to monitor at what stage the potential adopter is, in the appropriation process (to what extent the objectives are being achieved).

3.2 Discussion of stages

A discussion of the mental processes and activities involved in each stage of the appropriation paradigm is the object of this section.

3.2.1 Stage I: Presentation of Innovation

The innovation is presented to the target population in a language they can understand. If the object of the communication is to elicit a response from the population or trigger a reaction in a desired direction, it will serve no purpose to present the innovation in a language they cannot **comprehend** (from Latin *cum-prendre*: take along, take with). Translation and interpretation may be used but these have considerable limitations. (See for instance Kayum's 2012 findings on the limitations of translation as input medium).

3.2.2 Stage II: Awareness

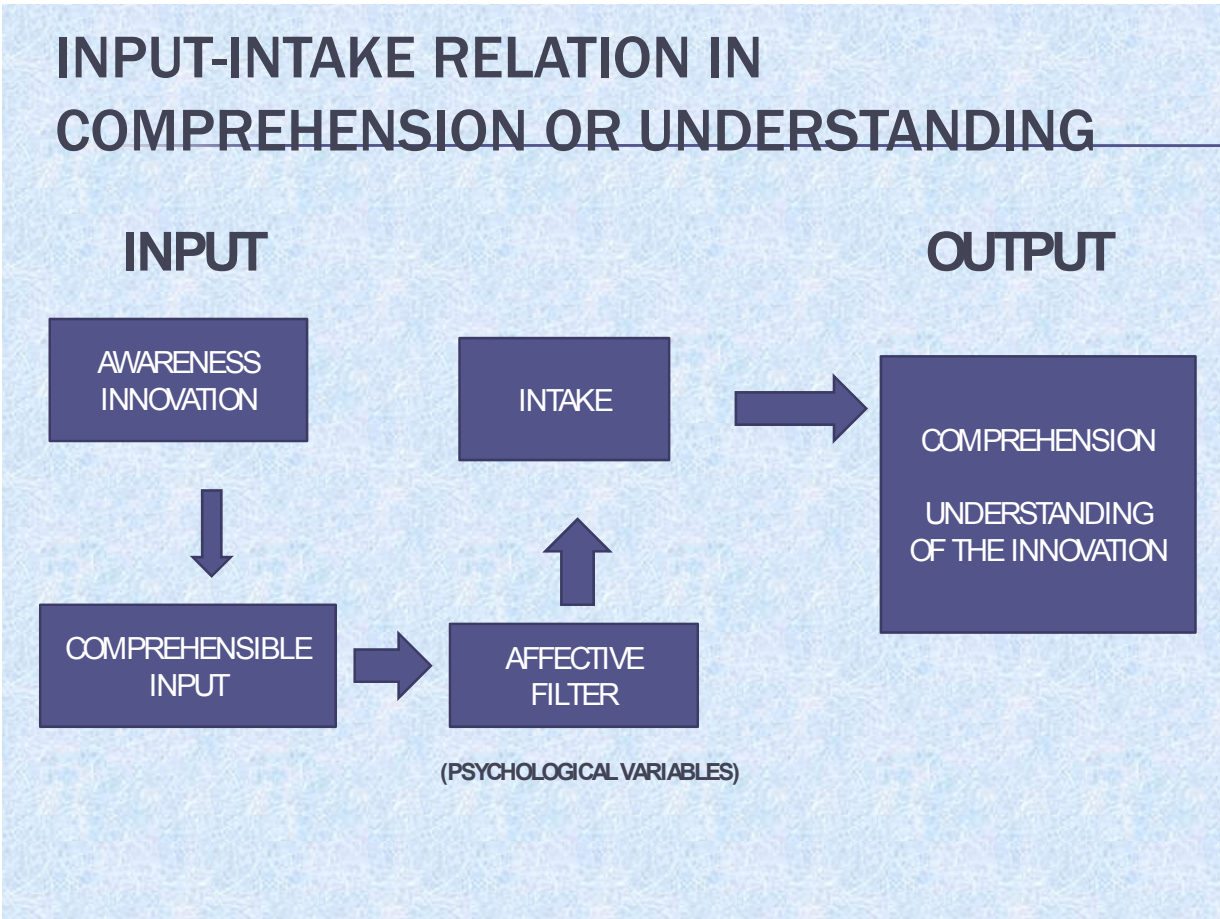
The contact with the novelty following its presentation, initially occasions, at least, an awareness of the innovation which is a superficial consciousness of the existence of the innovation. Although awareness is important as the gateway to the appropriation process, it is nevertheless only a superficial or a surface consciousness of the innovation as a new reality. Information that does not penetrate beyond the awareness level may produce indifference or superficial reaction of acknowledgement of the innovation only. The implication is that *awareness campaigns* are important but results can be guaranteed only when one aims further and beyond awareness.

The exact nature of Indicators of awareness may not be fully understood now but on the basis of what we know, they may be assumed to include: recall of the innovation in its general gestalt or holistic form, a synthetic perception or vague recall of the existence of some reality. (Further work is required from clinical and social psychologists to elucidate this and other relevant concepts further).

3.2.3 Stage III: Comprehension

This is patently the most central and the most significant level in the appropriation process in the sense that there is no chance of an innovation being accepted and adopted spontaneously and consciously if it has not been understood or comprehended. This stage therefore deserves special attention.

Comprehension itself is a process which can be modelled as presented below:



A model of the comprehension process central to the Appropriation Process, (adapted from Krashen 1981).

The Input Hypothesis postulated and motivated by Krashen (1981, 2003) holds that we acquire language only when we receive comprehensible input. Specifically, if *i* represent previously acquired linguistic competence (and extra -linguistic knowledge) that includes knowledge of the world and contextually relevant information, and if *+ 1* represents new knowledge or language structures that we should be ready to acquire, then we move from the acquisition of *i* to the acquisition of *i + 1* by understanding input that contains *i + 1*. Put simply, we acquire something new if the input to the acquisition process contains what we know plus something new, a little beyond what we know. The input hypothesis may be extended beyond language acquisition to include appropriation any novel idea information or technology.

As envisaged above, this underscores the fact that not all input is comprehensible and therefore, not all input leads to learning or acquisition. This should be quite uncontroversial for it simply means we cannot acquire, learn, adopt or appropriate what we are not capable of understanding or what we have not understood.

The innovation that goes beyond awareness is one that is understood because it is presented as comprehensible input to the target population or audience.

The innovation as comprehensible input is mediated by psychological variables that constitute what Krashen (1981, 2003) calls the “Affective filter” which includes *inter alia* the

frame of mind in which the target audience is at the moment of the communication. Thus, a frame of mind characterised by high anxiety, low self-esteem, and low motivation, etc. is likely to raise an invisible psychological wall that will block penetration of the input. However, if anxiety is low, and self-esteem and motivation are high and positive, this facilitates the penetration of the innovation-input so that input becomes intake. Once the innovation is taken-in as shown in the above diagram, there is evidence of comprehension in that the innovation is understood.

At this stage, we postulate indicators of **comprehension** to include the fact that the target audience can vividly, recall, and beyond recall can identify actors, actions, and results or consequences involved in the innovation. Thus, comprehension is achieved **by a more or less analytic perception of the new reality as opposed to the synthetic or holistic perception of the awareness level. Recall is more vivid as opposed to the vague recall of the awareness level.**

3.2.4 Stage IV: Knowledge

A comprehended innovation may still *evaporate* if it is not consolidated as “knowledge”. Knowledge is to “know” and keep what is known in the mind’s data-base and be capable of retrieving it with an appropriate cue as the key that unlocks the door to the store of knowledge. (In formulating this model, this stage benefits from insights from Cooper’s 1989 postulation of ‘knowledge’ as a relevant level in the dissemination of planned products of language planning). Epistemologically, we may ask the question, *how do we know that we know?* The key consideration in **knowledge** is the **consolidation** of the innovation with the ability to vividly recall, analyse, describe the innovation and make inferences relevant to elements and aspects of it, (among other things) as indicators of knowledge. For more epistemological questions on the foundations of knowledge see, for instance, Jung [1921] (1971), Russell (1948), Chomsky (1968) Popper (1975) and Stanley (2002).

3.2.5 Stage V: Evaluation (Judgment)

Even when an innovation is part of our repertoire of knowledge, individuals may have varying **attitudes and predispositions** vis-à-vis what they know.

This is because, between knowledge of an innovation and any reaction to that knowledge, there is a spontaneous **evaluation** of the innovation leading to a personal **judgement** that determines **acceptance** (if the judgement leads to a positive attitude) or **rejection** (if the judgement leads to a negative attitude). The acceptance of the new idea in the temple of the mind constitutes a climax, a *metanoia* (Greek for ‘change of mind’). The acceptance of the new idea or innovation may indeed be the result of a ‘change of mind’ or a conversion at the mental level following inputs in the process from the level of awareness. A change of mind in favour of the innovation is evidenced and backed by favourable dispositions and positive attitudes towards the innovation.

Indicators of this stage therefore include definite **attitudes** (positive or negative) towards the innovation. The judgement may not necessarily be ‘correct’. It may, indeed, be outrageously wrong. What is important and evident is that, faced with a new idea or product, judgements are made, attitudes developed and decisions taken (that may affect the mind-set and

behaviour). Acceptance does not always result from change of mind or *metanoia*. Only in situations where the innovation is at variance with a previously well-established position is acceptance of the innovation the outcome of a *metanoia*.

3.2.6 Stage VI: Appropriation of Innovation

Acceptance of the innovation is likely to lead to the appropriation of the innovation. Appropriation is evidenced not only by a **positive attitude** or disposition towards the innovation, but more importantly by personal action, action involving **behavioural change** congruent with the expectations of the proponents of the innovation.

The communication of an innovation that is intended to lead to appropriation must therefore be conscious of the role, function and impact of the (language) **medium of communication**, considering that the exigencies of **comprehension** as a central stage in the appropriation process require comprehensible input as a *sine qua non* condition. The effective implementation of the millennium development goals must therefore, go beyond awareness campaigns to ensure comprehension, and knowledge of the innovation and beyond that, undertake *attitude engineering* procedures (Chumbow 2009 and Chumbow 2011a) to polarise (negative) attitudes of the target group in favour of the innovation and ultimately, **monitoring** the process to elicit evidence of expected behavioural change which is the ultimate indicator of appropriation.

3.3 Indicators in the stages of the appropriation process

Indicators refer to evidence, pointers, or land-marks that show how well objectives are being achieved. They are elements that '**indicate**' the presence (or absence) of certain factors. Indicators are crucial in the operationalization of concepts and in the theory of appropriation developed here; indicators can ultimately be used to evaluate the level or degree of progress in an appropriation process.

The process of Appropriation of new ideas or technologies as conceived here is an empirical issue and what we present here cannot be considered complete. Further research will lead to refinement of the proposals, including indicators of the various postulated stages of the appropriation process. The need of research to establish indicators is borne out of the need to ultimately monitor the appropriation process by use of indicators to know at what stage in the process, a target population has arrived, and what needs to be done to enhance progress in the appropriation. In other words indicators are crucially relevant to the social engineering process geared towards change of attitude and change of behaviour. These indicators will show to what extent the social engineering objectives are being achieved.

There is no guarantee that a novel idea in any form, particularly an innovation in science and technology is immediately accepted and adopted once it is presented or communicated to the target audience. An innovation undergoes a *long journey* which may take it through several stages with the possibility that adverse factors may interrupt and abort progression at any level or stage of the journey, limiting the chances of the communicated input attaining its goal and achieving the expected effect in terms of outcomes and impact.

The task of **attitude engineering** in particular and **social engineering** in general concerns taking appropriate measures in a particular situation in ensuring that:

- i. a **high percentage** of 'input' becomes 'intake.'
- ii. *intake is provided with the 'facilities' necessary to maximise the emergence of most of the intake as output.*
- iii. Take note of the fact that what is processed is not necessarily input but intake
- iv. Etc.

To conclude this section, on the model, recall that in the critical last two stages, the potential adopter is brought to a 'metanoia', indicated by a positive attitude towards the innovation. Positive attitudes predispose one to **appropriation** which is evidenced by a powerful indicator, 'change of behaviour'. Thus, in our experience, social engineering resulting in the much desired '**change of mind set**' is best achieved through **attitude engineering** since the mind is not readily accessible. Attitude engineering or manipulations to change attitudes, putatively, will lead to a change of mind and change of behaviour. Similarly, an ideological input powerful enough to change the mind (set) will lead to change of attitude and ultimately change of behaviour. The correlation between **attitude**, **mindset** and **behaviour** is a reasonable assumption or claim we make as an empirical issue for the model.

Thus, **awareness campaigns**, the focus of development activities are ill conceived as a goal and finality, for, indeed, awareness is best envisioned as an initial stage in a long process of innovation appropriation.

While future research will contribute to the verification and edification of the much needed model of innovation appropriation, there are case studies that are congruent with and support the principal ideas of the above model, one of which is presented in the following section.

4. Case study: Language use and level of appropriation of innovations in Cameroon

The goal of the study by Kayum (2012) is to find out what medium of communication is used by health personnel in reaching out to target groups in the process of implementing the health millennium development goals (MDGs) in the multilingual setting of Cameroon, how this is done and how effective the process is in terms of appropriation of new ideas, techniques and technologies in the health sector by target populations. (It is useful to keep in mind, in terms of the linguistic situation, that Cameroon has French and English as official languages and over 260 indigenous languages which vary from one of the ten regions to another).

One of the four research objectives congruent with the above goal which will interest us particularly is presented by the researcher as follows:

- *"To find out the correlation between language use and the level of appropriation of the new ideas, knowledge and technologies of the Health MDGs by target population" (Kayum 2012: 6)*

The research question reflecting this objective is as follows:

- *"Does the use of the language mastered by the target population lead to a greater appropriation of new ideas, knowledge and technologies of Health MDGs?"*

This is formulated as a research hypothesis in the following terms:

- *The more communication is done in the language mastered by the target population, the greater the level of appropriation of the new knowledge and technology.*

To verify this hypothesis the research design involves working with a population sample of 564 persons who had actually participated in sensitization or awareness campaigns in one of the health MDGs (reduction of infant or maternal mortality, reduction of HIV/AIDS, ‘roll back malaria’, etc.). The sample drawn from three regions of Cameroon (Centre, West and East regions) was focused on the three capital cities of the regions (Yaounde, Bafoussam and Bertoua) each stratified to take into consideration urban versus rural communities, sex, age, and other relevant variables with respect to the other research objectives and research questions. Another sample of health officials (about 66) who actually conducted the awareness campaigns was part of the study to enable the researcher corroborate responses of the target population and verify other hypotheses (not directly relevant to the above hypothesis to be presented in this case study).

The instrument for data collection is a questionnaire administered and in some cases followed by (interpersonal oral) interview questions. The relevant questions from the appropriate section of the questionnaire that seek to verify the hypothesis will be presented along with discussions below.

Fifteen questions (15-29) seek to verify elements of the various stages of the appropriation process, from **presentation of new health information**, (innovations in science and technology) through **awareness** to **comprehension**. Five questions (30-34) seek to verify and ascertain facts and issues pertaining to the last three stages of the appropriation process from **Knowledge** (derived from the presentation) through **Evaluation and Judgments** made about received innovations to effective **Appropriation** of the innovations.

For the purpose of the verification of the hypothesis, a summary of relevant and crucial findings are presented here.

The research established that about 78% of the sensitization and workshops were carried out only in French and English, the official languages (OL) while about 20% was carried out in the official languages with interpretation and translation into the Cameroonian local languages i.e. non-official languages (NOL). Thus, virtually all presentation was done essentially in the OL with or without interpretation. The linguistic background of the 564 participants shows that those who spoke some form of the official language (French or English only, French and/or English along with a local language were 396 and those who spoke no form of the official language (NOL) were 168. Details are presented in table 2 and reflected in chart 1 below.

Language	Bafoussam		Bertoua		Yaounde		Language total	% language distribution
	U	R	U	R	U	R		
OL	78	33	75	39	105	66	396	70.21
NOL	15	54	18	57	3	21	168	29.79
Town total							564	100

Table 2. Language distribution of OL/NOL.

Therefore, 70.21% of the respondents were OL speakers while 29.79% were NOL speakers.

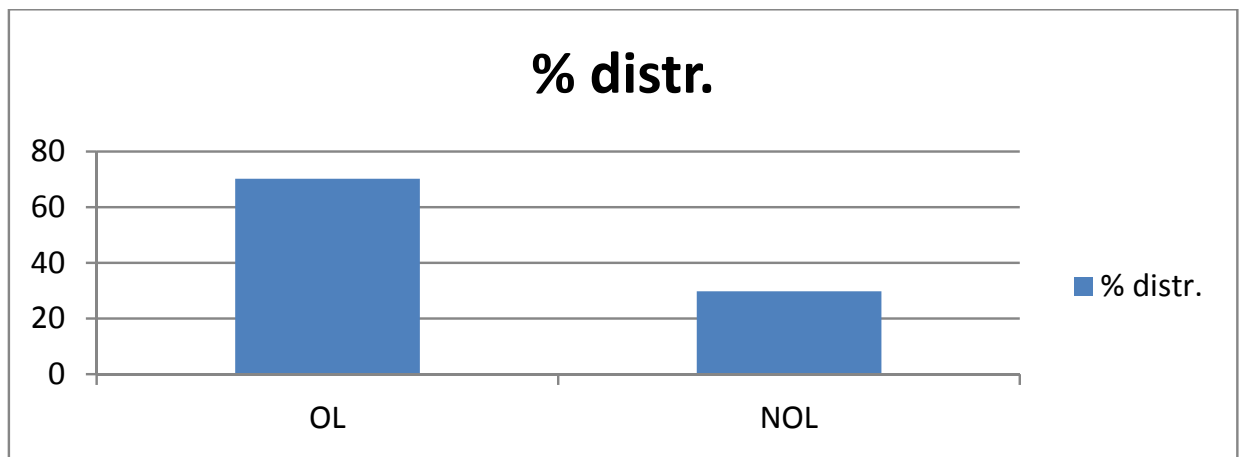


Chart 1. Language distribution of OL/NOL.

4.1 Language and comprehension

Concretely therefore, the research hypothesis is centred on finding out whether (since the language of presentation of new ideas and new practices and technologies in the health sector is the OL), those who master these languages (OL) comprehend and appropriate more than the non-official languages (NOL) speakers.

Comprehension was elicited by the simple question ‘Did you understand the message of the campaign or workshop?’

Chart 2 below, shows that the percentage of those who claim to have understood the message of the innovations (in blue) is clearly higher than those who did not (red).

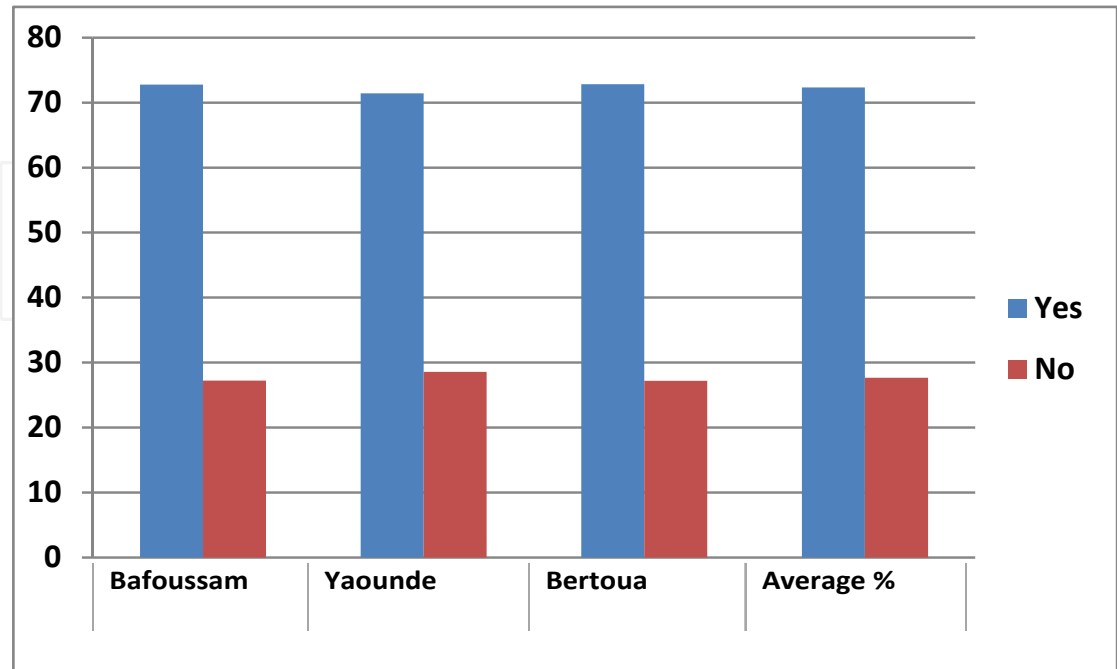


Chart 2. Comprehension level.

Beyond comprehension, it is important to know how well and to what degree. Chart 3 below, shows in terms of histograms, the **degree of comprehension** of the core messages of the awareness campaigns and workshops in percentages in the three localities. The fourth histogram (in violet colour) shows the average value for the locality.

The **degree of comprehension** is elicited by the question. ‘How well did you understand what was said during the programme?’ (Use the following frame :)

Excellent: I understood at least 90% of the message.

Good: I understood at least 70%.

Fair: I understood at least 50%.

Bad: I understood at least 30%.

Poor: I understood less than 30%.

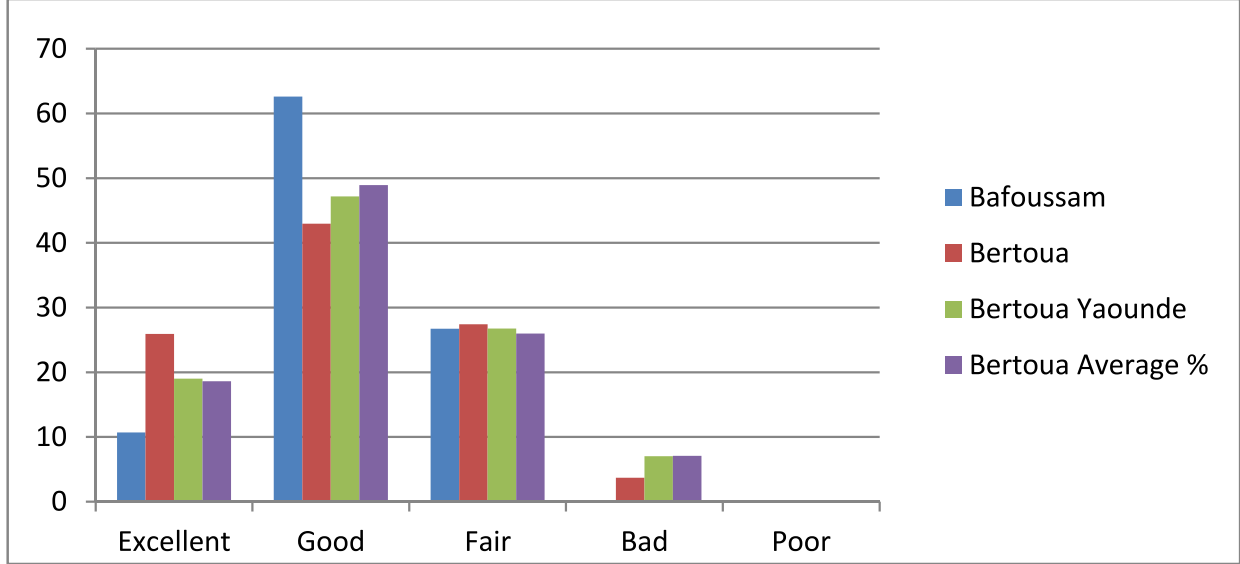


Chart 3. **Degree of Comprehension.**

When **comprehension** is considered in terms of the dichotomy that concerns our hypothesis i.e. official languages (OL) versus non official languages (NOL), the statistics are as attested in table 3 and reflected in charts 4 and 5 below.

Answer	Language	Bafoussam				Bertoua				Yaounde				Total	Average % distr.
		U	R	T	T%	U	R	T	T%	U	R	T	T%		
Yes	OL	67	23	90	68.70	66	23	89	65.93	84	51	135	95.07	314	76.96
	NOL	4	37	41	31.30	4	42	46	34.07	1	6	7	4.93	94	23.04
Answer Total				131	100			135	100			142	100	408	100
No	OL	11	10	21	42.86	9	16	25	46.30	21	15	36	67.92	82	52.56
	NOL	11	17	28	57.14	14	15	29	53.70	2	15	17	32.08	74	47.44
Answer Total				49	100			54	100			53	100		100

Table 3. **Distribution of Language Used and Level of Comprehension.**

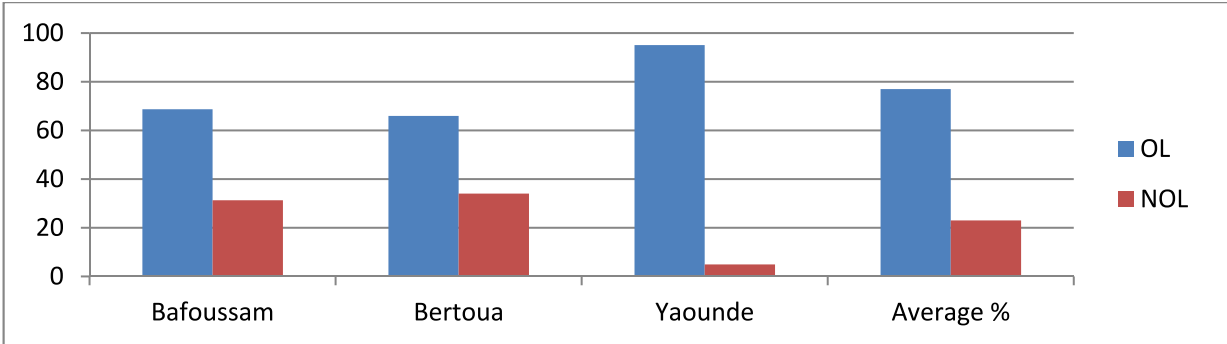


Chart 4. Bar Chart of Language Use and Percentage of Comprehension.

Chart 4 above, indicates the percentage of those from the OL and NOL groups who answered ‘Yes’ to the question of comprehension while chart 5 below shows the percentage of those who did not comprehend the message in both groups.

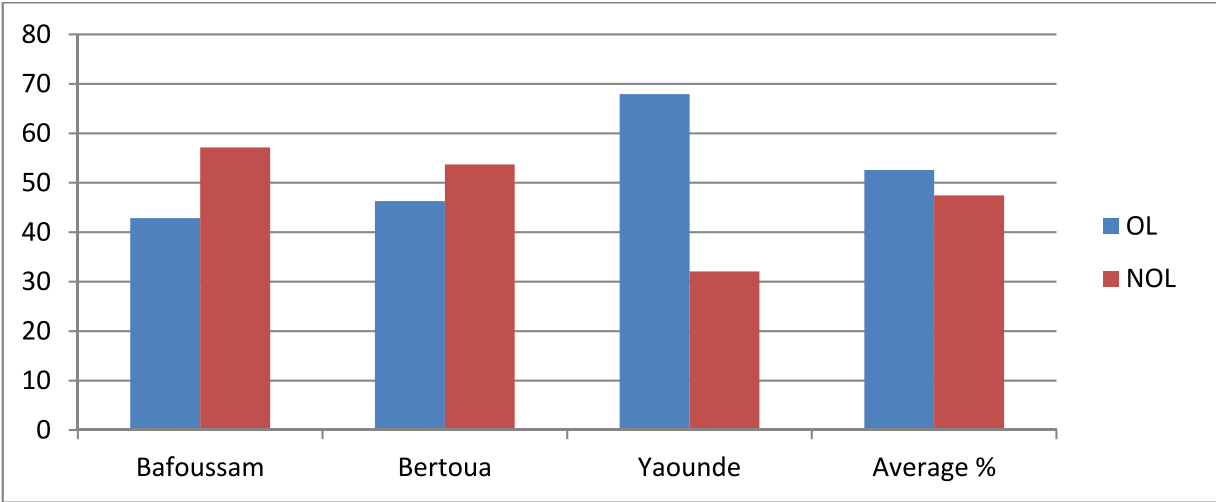


Chart 5. Bar chart of language Use and percentage of non-comprehension.

The above data (table 3), shows that of the 405 respondents who comprehended the message, 314 (76.96%) are of the OL category and 94 (23.03%) in the NOL category. These statistics ,in absolute terms, are largely in favour of comprehension by the OL.

When those who did not comprehend the message are considered, the absolute figures from table 3 reflected in chart 5, show that in absolute terms, more people in the NOL group did not understand in two of the three localities as can be seen in the Average in chart 5. (The Yaounde locality has more OLs who did not comprehend for reasons of exceptional factors of the paucity of rural population in the sample, this being the capital city as explained by Kayum 2012). On the average, in **absolute terms**, the percentage of OL is 52.36% to 47.44% for NOL (table 3 and chart 5).

This, on the surface appears to be paradoxical. However, when the figures are considered in **relative terms** (as they should), that is, when the numbers are considered relative to total population in each category, the OL figures are 20.84% (82/396 while the NOL figure is 44.05% (74/168). This indicates that in relative terms fewer respondents of the OL group had difficulties with comprehension of the message than respondents of the NOL group.

The above provides evidence to the effect that *the more communication is done in the language mastered by the target population, the greater the level of comprehension of new information and innovations*. Indeed, as observed by Kayum 2012: 78, ‘the majority of those who understood the new knowledge transmitted during the awareness campaign were OL speakers and the majority of those who did not understand are NOL speakers’. In order words, there is a correlation between mastery of **language of communication** and **comprehension** of new information in that language.

With respect to the level/degree of comprehension of information on innovations, charts 6 and chart 7 below summarise the facts for the OL and NOL.

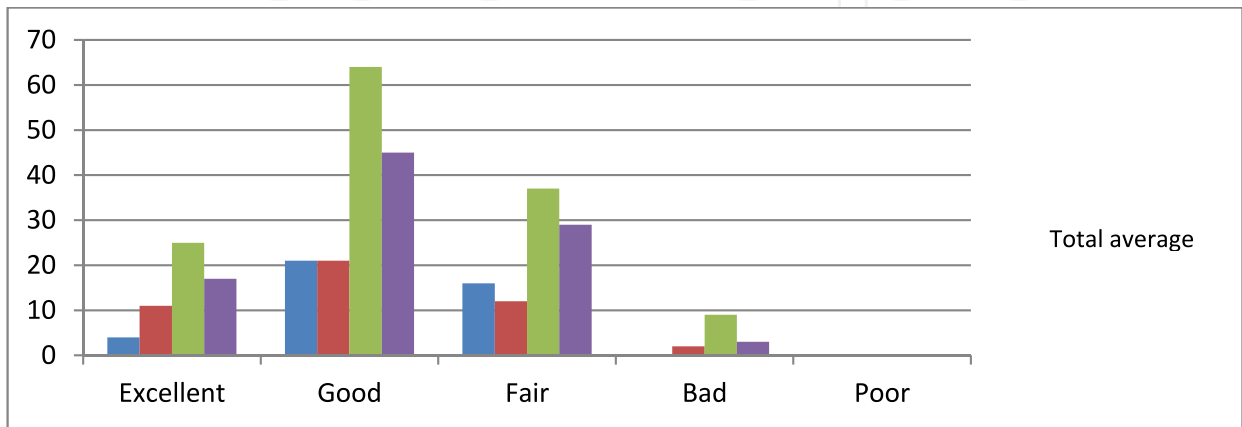


Chart 6. Degree or Level of comprehension within the OL Group.

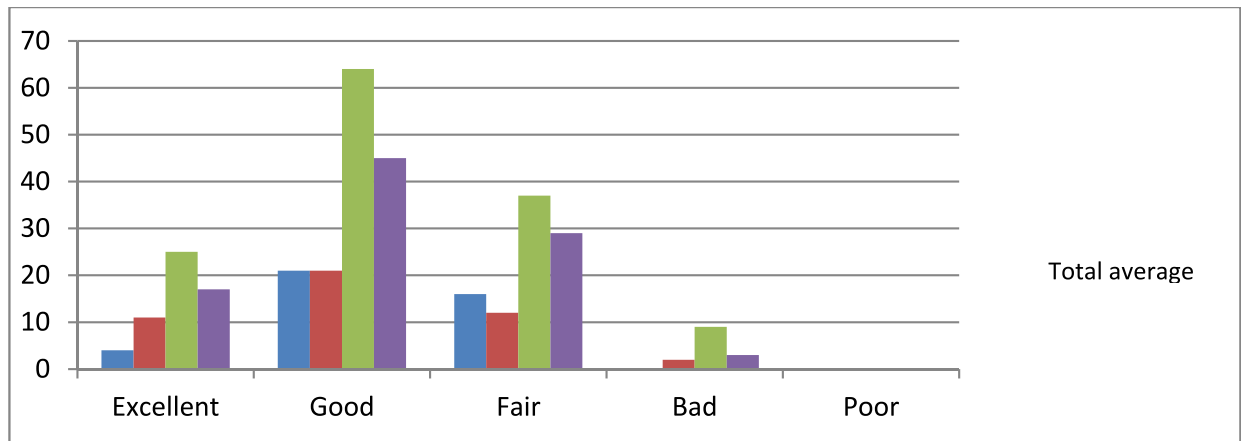


Chart 7. Degree or levels of Comprehension within the NOL Group.

In terms of **degree of comprehension**, a reasonable assumption to make is that the ‘Excellent’ and ‘Good’ levels constitute an above average level of comprehension that can be contrasted with the more doubtful evidence of comprehension(‘Fair, Bad and Poor). Within this perspective statistics reflected by charts 6 and 7 shows that 69.94 % attest an above average degree of comprehension in the OL group as opposed to 65.96 % in the NOL group. When a **t-test of significance** is done, it shows a p-value of 0.001731. Since normally a p-value of less than 0.05 is considered significant, it means the difference here is quite significant and should be interpreted to mean that *not only do more OLs comprehend the new*

health messages than the NOLs, their level of comprehension of the messages is significantly higher and better than that of the NOLs.

4.2 Language and appropriation

The second phase of the appropriation process starts with the stage of knowledge for which Chumbow 2010 proposed **retention** and **vivid recall** of information *etc. as indicators*

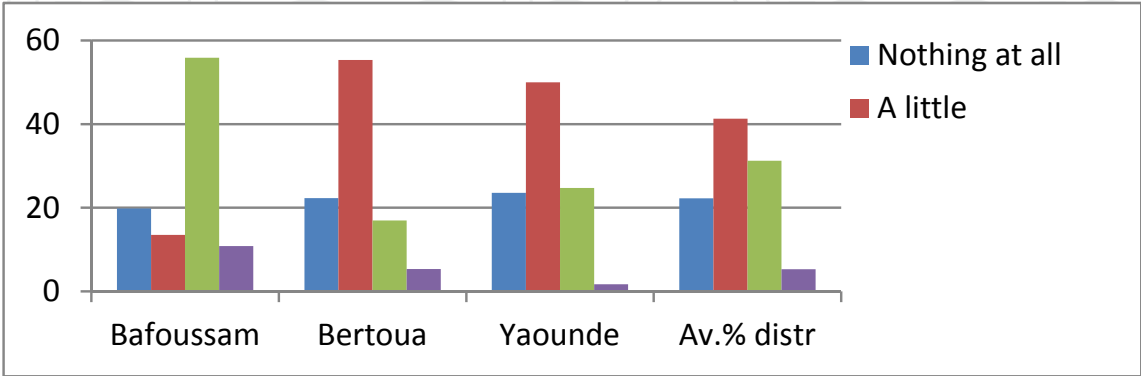


Chart 8. Level of Retention (OL).

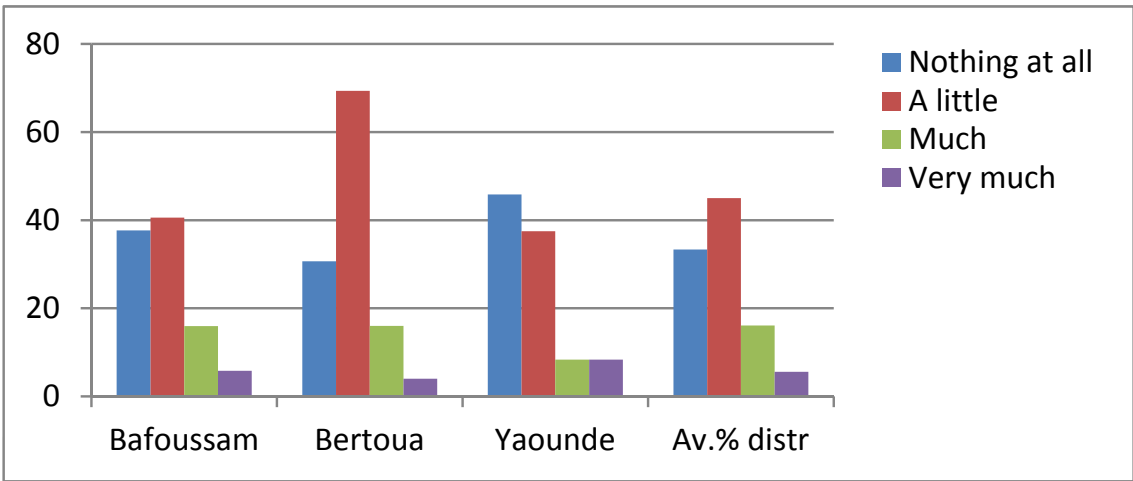


Chart 9. Level of Retention NOL.

As evidenced in charts 8 and 9 above, this case study measures the rate of retention of received innovation information and found that 36 % of OL speakers retained something new as opposed to 21 .67% for NOL. (This is the average of the ‘very much’ and ‘much’ variables). **The t-test results give a p-value of 0.011467 which is far less than 0.05, meaning that the difference in percentage of OL speakers and NOL speakers who retained much is quite significant.**

The next stage, involving reflection on the knowledge and value judgement is ascertained in this case study by elicitation of the **impressions** of respondents on the **importance** of the innovation. Also, evidence of the stage of appropriation (acceptance or rejection of innovations) to be discussed below, implies that judgement was made. Here again, the OL group exhibits a significantly better level of positive attitude than the NOL group.

Appropriation in this case study was elicited through a number of salient indicators such as (a)admission that new knowledge was acquired or learned, (b)sharing of some new knowledge learned with a third party, (c)personal application of innovation and ultimately, (d) behaviour change (as a result of contact with the innovation). In all these cases, available statistics following the same manner of contrastive display as above, show that the OL group has a significantly important and higher level than the NOL group (Kayum 2012: 86-97). In all cases, t-test results show that the OL versus NOL differences are in favour of OL and are statistically significant. Two illustrations would suffice.

Application of Knowledge: From those who admitted learning something new, 65.76% of OLs applied what they learned against 61.90 % for the NOL group. This is reflected in the bar charts10 and 11 below. In absolute terms, the difference of 3.86 appears to be of little significance but the t-test shows a p- value of 0.004417 which means that the difference is significant (but less significant than values for previous indicators). This means that other variables are at work. (These variables discussed in Kayum 2012 are not crucial here).

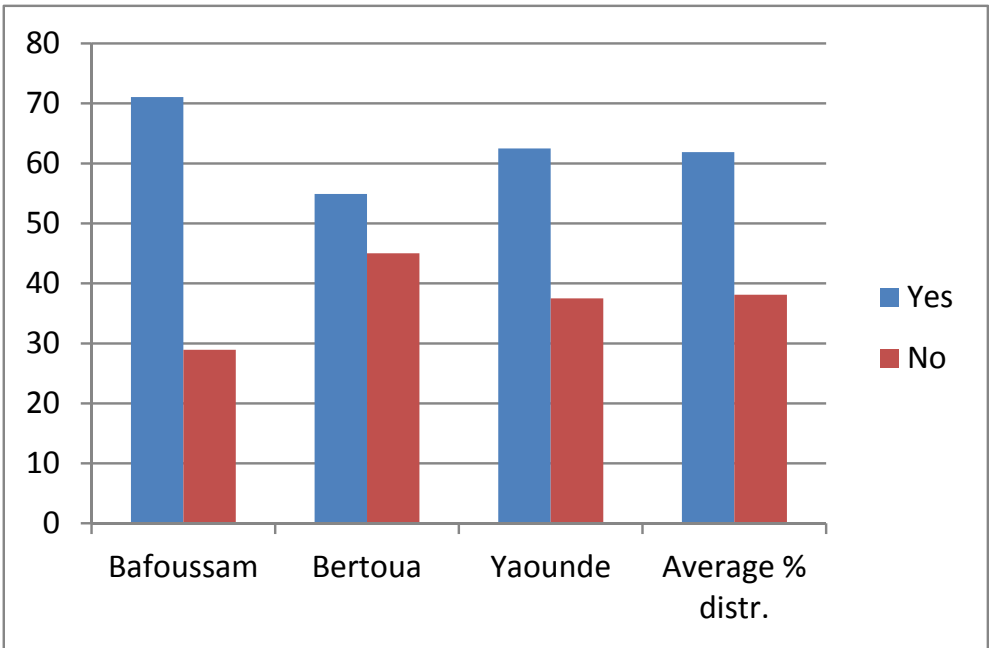


Chart 10. Application of new knowledge (OL).

Change of Behaviour: As chart 12 below indicates, some of the respondents effectively changed their attitude and behaviour after receiving new information and new knowledge from the sensitization campaign and workshop but less than 50% or exactly 43.09% are in this category. Change of behaviour in these circumstances is *prima facie* evidence of appropriation.

4.3 Comprehension versus appropriation

The results in charts 11 and 12 above raise a number of important questions on the correlation between comprehension and appropriation. To what extent do those who comprehend the message of the new knowledge and technology appropriate the innovation?

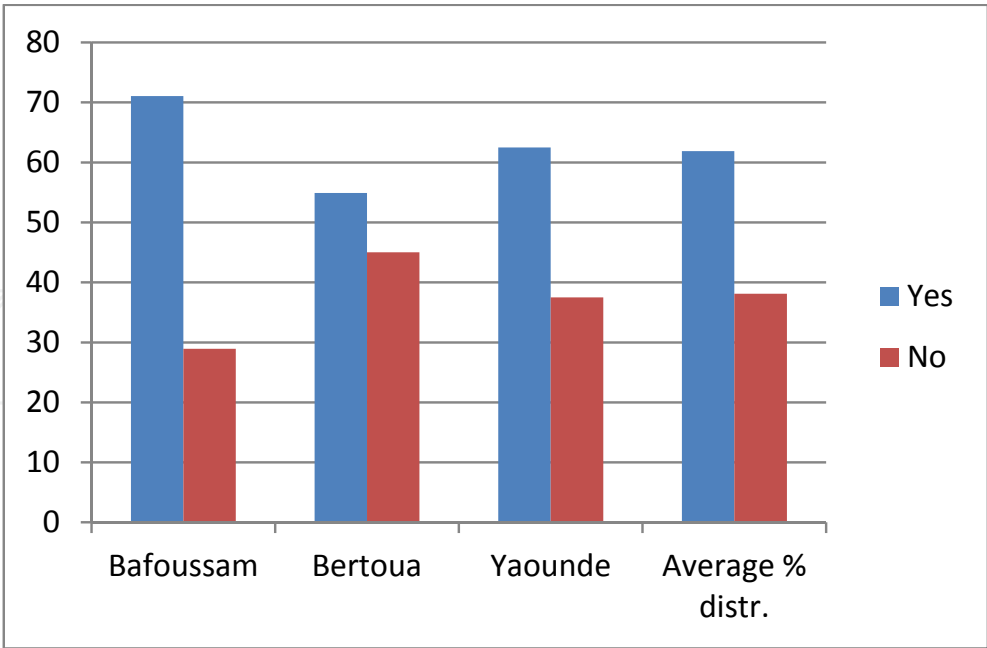


Chart 11. Application of new knowledge (NOL).

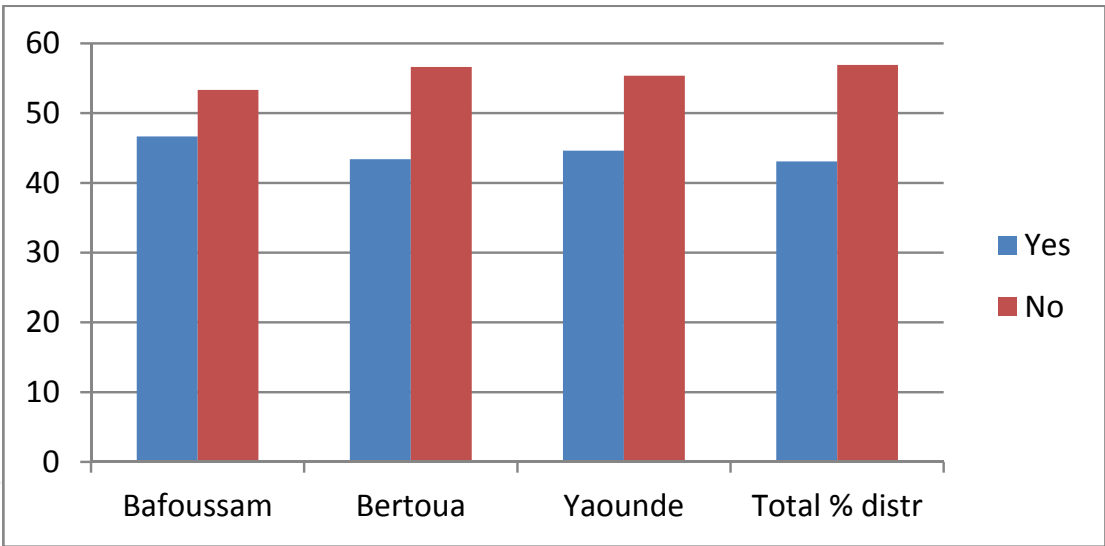


Chart 12. Change of behaviour (Indicator of appropriation).

The relevant figures as seen above are that 72.34% of the respondents comprehended the messages but only 43.09 actually showed evidence of appropriation of the message by change of behaviour congruent with the expected content of the innovation (chart 12). The contrast between level of comprehension and level of appropriation is evidenced by chart 13 below.

The fact of a glaring gap between comprehension and appropriation confirms and underscores assertion of Chumbow 2010 that ‘**comprehension is ‘a sine qua non condition for appropriation but not a sufficient condition’** in other words; language and comprehension are an indispensable but non-sufficient condition for appropriation to take place. While the message of the innovation must be presented as comprehensible input in a language known

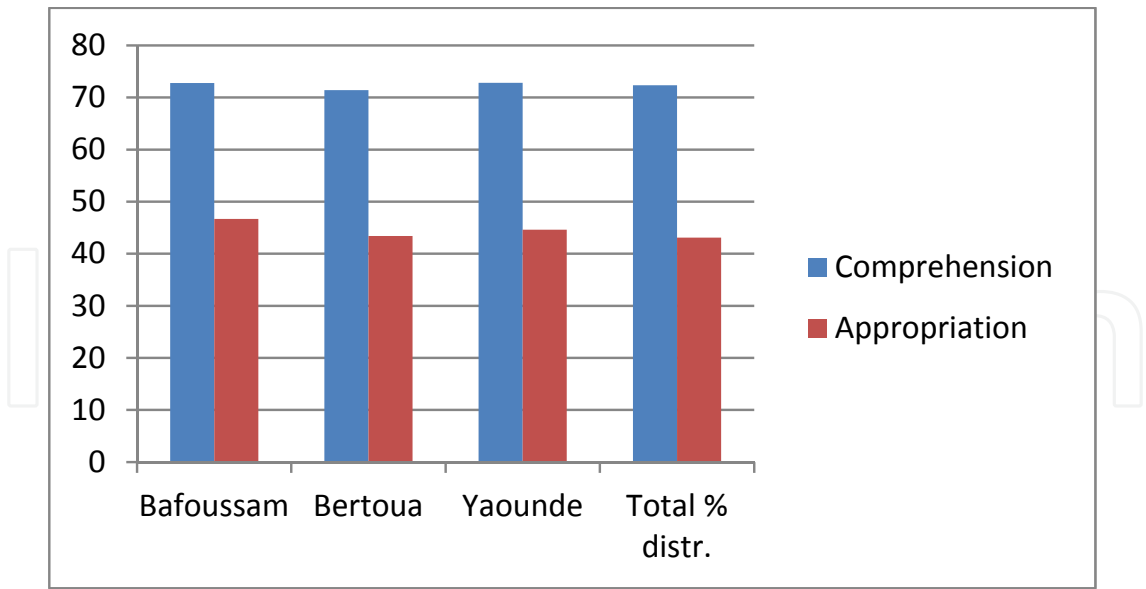


Chart 13. Levels of Comprehension versus Appropriation.

to the targeted audience, other variables may vitiate the process of appropriation of the novelty. These may include poverty (lack of resources to carry out what one believes in), cultural beliefs, practices and taboos as barriers, etc. These must be identified and analysed in order to effect **social engineering** that seeks to remove barriers and hurdles and polarize any negative attitudes in the desired direction of the change of attitude or change of behaviour required and expected by the innovation.

5. Implications for social sciences and national development

The most fundamental characteristic of the present millennium is that it is the age of ‘knowledge economy’ characterised by knowledge production, knowledge dissemination and knowledge appropriation.(Chumbow 2011b) Globalisation impacts make innovations from the science and technology (S&T) knowledge industries and Research-Development (R-D) innovation Parks available for acquisition and appropriation subject to economic considerations. While input constraints limit the quantity and quality of knowledge that can be created or produced by developing countries for the knowledge economy, developing countries can more readily appropriate available knowledge. The challenge in the heavily indebted poor countries and the developing countries aspiring to attain the status of emergent nations is first and foremost that of the appropriation of available innovations relevant for their national economy and national development industry while building the knowledge creation industry. The availability of and a better understanding and mastery of the appropriation model would be crucially relevant for the enterprise of national development. The development of social engineering principles in general and appropriation principles in particular by social scientists will prove to be crucially relevant to social and economic transformation of nations.

6. Conclusion

The case study does verify and illustrate the key issues of the innovation appropriation model which is the subject and object of this paper. It illustrates particularly, the

indispensability of the language factor in the comprehension and appropriation process of innovations but leaves room for unanswered questions with respect to some indicators of the stages and other variables that will need to be taken up by subsequent research sooner than later, given the importance of **appropriation** in the enterprise of development in particular and knowledge dissemination and knowledge appropriation in general.

In this regard, emphasis must be laid on the fact that all models and theoretical frameworks in their initial formulation are an **empirical issue** in at least two ways. Firstly, a theoretical model is not arbitrary but is based on some empirical observations of facts that give the model credence and its fundamental appeal with respect to explanatory adequacy of observed phenomena (Chomsky 1965).

Secondly, a theoretical model is an empirical issue because, at least, some of its postulates are amenable to and must be subjected to empirical research for verification, refinement and modification where warranted by empirical evidence from the field (and if need be, the entire paradigm can be jettisoned and replaced for lack of evidence and credibility).

It is in this second meaning that Khun's 1969 'Structure of Scientific Revolution' is justified in the sense that the subjection of theories to empirical fact finding leads to paradigm enrichment and consolidation or else to paradigm 'falsification' that in turn, leads to **paradigm shift**. (See also Popper 1975). Paradigm shifts are salutary developments in the growth of science because they may permit a break-through in the existing frontiers of knowledge and usher in new knowledge. . And, of course, the cumulative effect and avalanche of new knowledge is responsible for progress and humanity's present high level of development in the era of knowledge economy and information and communication technology. Therefore, the **model of appropriation of innovations** presented here will and should, of necessity, fulfil its destiny as an empirical issue.

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