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Modeling ICT Adoption Factors for the Preservation of Indigenous Knowledge

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***Abstract*—**Indigenous Knowledge (IK) has many social and economic benefits. However, IK is at the risk of extinction due to the difficulties to preserve it as most of the IK largely remains undocumented. This study aims to design a model of the factors affecting the adoption of Information and Communication Technologies (ICTs) for the preservation of IK. The proposed model is based on theoretical frameworks on ICT adoption. It was designed following a literature review of ICT adoption theories for households, and of the factors affecting ICT adoption for IK. The theory that fitted to the best all factors was then chosen as the basis for the proposed model. This study found that the Model of Adoption of Technology in Households (MATH) is the most suitable theoretical framework for modeling ICT adoption factors for the preservation of IK.

***Keywords*—**Adoption factors, ICT adoption theories, Indigenous knowledge.

I. Introduction

INDIGENOUS Knowledge (IK) refers to ideas, beliefs, values, norms, and rituals, which are native to a local community, and are embedded in the minds of locals [1], [2], [3]. According to [13], IK is an integral part of the development process of local communities; therefore it is the key to sustainable social and economic development for local communities. One may ask why worry about Indigenous Knowledge in this ever technological world. Research conducted by [10] shows "how:

- IK can provide problem-solving strategies for local communities, especially the poor;
- Learning from IK can improve understanding of local conditions;
- Understanding IK can increase responsiveness to clients;
- Building on local experiences, judgments and practices can increase the impact of a development program beyond cost-effective delivery of staples;
- Indigenous approaches to development can help to create a sense of ownership that may have a longer lasting impact on relations between the local population and the
- local administration, giving the former a means of monitoring the actions of the latter;
- IK can provide a building block for the empowerment of the poor".

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II. Problem Statement

Despite the above highlighted benefits of Indigenous Knowledge, existing research shows that IK is at the risk of extinction due to the difficulties to preserve it. According to [3], Indigenous Knowledge (IK) is rapidly disappearing as the transfer of IK from generations to generations is mostly done through oral traditions and demonstrations, and IK is usually stored in the minds of elderly people who may die. Thus, most of the IK largely remains undocumented. Furthermore, constraints of using Indigenous Technical Knowledge (ITK) are identified by [2] as follows:

- "Lack of standardization and documentation of indigenous technologies and practices;
- Education and exposure especially of the young generation to modern training have biased people's attitudes towards using ITK;
- Some religious beliefs do not encourage indigenous beliefs and technologies regarding them as demonic and superstitious;
- The educated people despise some indigenous methods referring to it as ineffective and dirty;
- Selfishness that inhibits people from passing on knowledge to others;
- ITK was reported as not effective in large scale production;
- Depletion of most trees and herbs that are sources of local medicine;
- Variation in prescription such as quantity to administer at a time and for how long".

III. Aims and Objectives

The previous section of this paper highlighted the need to preserve Indigenous Knowledge. Having in mind the predominant of Information and Communication Technologies (ICTs) in the modern world, it seems interesting to investigate how ICTs are used in the preservation of IK. What are the factors affecting the adoption of ICTs for the preservation of IK? The aim of this study is to model ICT adoption factors for the conservation and promotion of indigenous knowledge.

IV. Literature Review

This is a two-stage literature review study as described by the next section.

V. Research Design

This research conducted two literature reviews. A first literature review was conducted to identify general technology adoption theories for households. A second literature review was conducted to identify factors affecting ICT adoption for the preservation of Indigenous Knowledge. The authors then attempted to fit these factors into each technology adoption theoretical framework, and then chose the best framework, using factors fitness as a comparison criterion.

VI. Results

This section presents the results of this research in terms of the identification of existing technology adoption theories for households, and of ICT adoption factors for the preservation of indigenous knowledge. The section ends with the presentation of the matching of the factors with the theoretical frameworks, as the basis of the selection of the most appropriate theoretical framework.

A. Technology Adoption Theories

The following theoretical frameworks for households are presented in this section: the Model of Adoption of Technology in Household (MATH), the Household Internet Adoption Model (HIAM), and the Indigenous Household Adoption Model (IHAM).

1. Model of Adoption of Technology in Household

The Model of adoption of Technology in Household or MATH [4] hypothesizes that a set of three beliefs, namely *attitudinal belief, normative belief, and control belief* influences household Personal Computer (PC) adoption (Fig. 1).

i. Attitudinal Belief

Attitudinal *belief* refers to the "behavioral beliefs that relate to favorable outcomes that result from performing the behavior" [4]. MATH presents five attitudinal beliefs, grouped into three sets of outcomes: *utilitarian, hedonic, and social [5]*. *Utilitarian outcomes* can be divided into beliefs related to personal use, children, and work. Specific issues include budget, homework and work. It is driven by the three factors namely: *Application for use* which is the "extent to which using a PC enhances the effectiveness of household activities" [4], *Utility for Children* which is the "extent to which using a PC enhances the children's effectiveness in completing homework and other activities" [4], and *Utility for work related* which is "The extent to which using a PC enhances the effectiveness of performing work-related activities" [4]. *Hedonic Outcomes* refer to the "Pleasure derived from PC use. Specific [activities] include games, fun, enjoyment and pleasure" [4]. It is influenced by the *Application for fun* factor which is also defined as "the pleasure derived from PC use" [4]. *Social Outcomes* refer to "the change in status that coincides with purchase decision." [4] and it is influenced by the *Status gain* factor which is "the status gained from possessing current technology, the increase in prestige that coincides with a purchase of the PC for home use" [4].

ii. Normative Belief

The normative belief refer to the "influences of family, friends, and other important referents" and it is affected by social influences [4]. *Social Influences refer* to "the extent to which members of the social network influence one another's behavior. Specific phrases include "Others expect me to..." and "My friends think..." [4].

It is driven by the following factors: *Friends and family influences* defined as 'the extent to which friends and family influence one another's behaviour" [4]". *Secondary sources influences* defined as "the extent to which information from TV, newspaper, and other secondary sources influences behavior" [4]; and *Workplace referents influences* referred as "the extent to which co workers influence behavior" [5].

iii. Control Belief

The *control belief* relates to "barriers to adoption posed by knowledge and cost" [4]. These barriers are influenced by factors that inhibit consumers from adopting household technology, namely: fear of technological advances, declining cost, cost, perceived ease of use, and requisite knowledge. *Fear of technological advances* refers to "the extent to which rapidly changing technology is associated with fear of obsolescence or apprehension regarding a PC purchase" [5]. *Declining cost* refers to "the extent to which the cost of a PC is decreasing in such a way that it inhibits adoption" [5]. *Cost* is "the extent to which the current cost of a PC is too high" [5].

Perceived ease of use is "the degree to which using the PC is free from effort" [5]; *And Requisite Knowledge* is defined as "the individual's belief that he/she has the knowledge necessary to use a PC" [5]. Control beliefs include external and internal factors, depending on whether they are constraints tied to the environment or cognitive ability/effort [5]. The first three factors (fear of technological advances, declining cost, and cost) are external, and the latter two (perceived ease of use and requisite knowledge) are internal [5]. In terms of future purchase intention, utilitarian outcome expectation happens to be the key driver, while rapid change of technology appears to be the primary barrier [6].

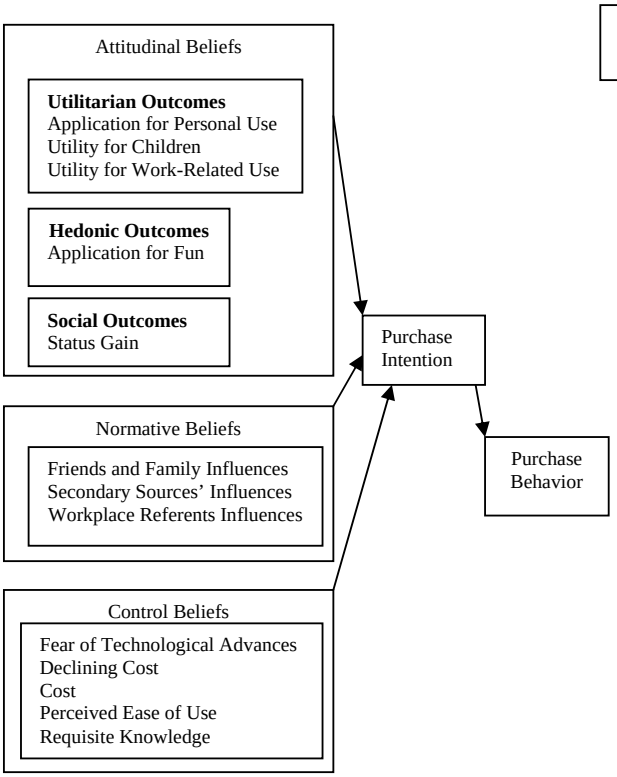

Fig. 1 The Model of adoption of technology in household (MATH) [7]

2. Household Internet Adoption Model

The household internet adoption model (Fig. 2) identifies three internal beliefs: *individual perceived needs, perceived ease of use, and perceived behavioral control* [8]. *Individual perceived needs* refer to "the extent to which the technology fulfills person's needs"[8]. *Perceived ease of use* is defined as the "degree to which a person believes that using a particular system would be free of effort. This follows from the definition of ease, which refers to freedom from difficulty or great effort" [8]. *Perceived behavioural control* reflects "beliefs regarding access to the resources and opportunities needed to perform a behaviour" [8].

These internal beliefs are influenced by five factors: Image, Subjective norms, Family influence, Self efficacy, and Perceived resources. The first three factors (Image, Subjective norms and Family influence) are considered as external factors. *Image* represents "the degree to which use of IT is perceived to enhance one's status in one's social system" [8]. *Subjective norms* refer to the "perceived social pressure to perform or not to perform the behavior" [9]. *Family influence* is defined as the "degree to which an individual may be influenced by family members to adopt internet" [8]. *Self efficacy* is defined as "an individual's self-confidence in his capabilities and competencies to perform a behaviour" [8]; And *Perceived resources* refer to "an individual's belief that he or she has the resources needed for adoption and using an information system or technology" [8].

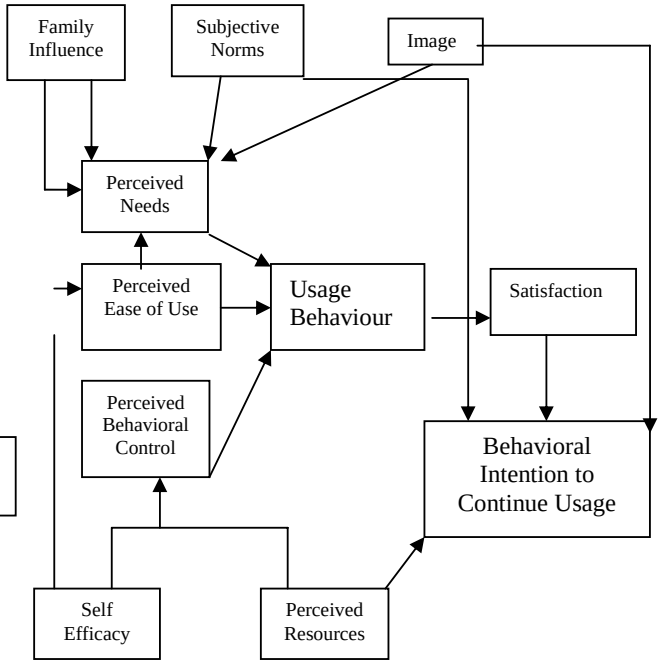

Fig. 2 The household internet adoption model [8]

3. Indigenous Household Adoption Model

The Indigenous Household Adoption Model or IHAM (Fig. 3) is based on the definition of the following five agents:

"I represent Indigenous agents from the Indigenous field, 'C' represents indigenous school aged children from the indigenous field, 'T' represents ICT tasks in employment and education fields, 'It' and 'Ct' represents result of using ICTs in the employment and/or education fields" [10].

The above agents are used by the Indigenous Household Adoption Model [10] to identify four constructs: *employment field, social network of ICT adopters, education field, and indigenous field.*

The employment field is made up of I, It and T agents. The social network of ICT adopters' field, the education field and the indigenous field have the following agents in common: I, T, C, It and Ct agents. Education field is made up of I, T, C, It and Ct agents.

B. Factors Affecting ICT Adoption for the Preservation of Indigenous Knowledge

According to the existing literature the adoption of Information and Communication Technology (ICT) is affected by the following factors: Access to ICT technologies, Computer literacy and ownership, ICT based Indigenous Knowledge content, Low ICTs influence in IK transmission, Communication preference, Geographic environment, purpose of ICT use, Educational and socio-economic status and ICT awareness (Table I).

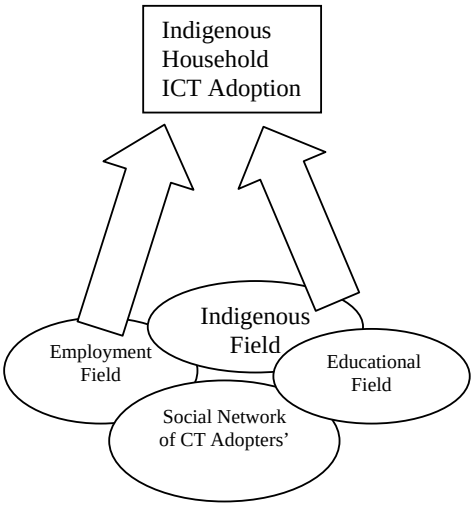

Fig. 3 The Indigenous Household Adoption Model [10]

TABLE I
ICT ADOPTION FACTORS FOR INDIGENOUS KNOWLEDGE PRESERVATION

Factor	References
B1. Access to ICT	[12]
B2. Computer literacy and ownership	[12]
B3. Availability of ICT based indigenous knowledge content	[13]
B4. ICTs influence in IK transmission	[13]
B5. Communication preferences	[10], [14]
B6. Geographical environment	[11], [13], [15]
B7. Purpose of ICT use	[10]
B8. Educational and socio-economic status	[2], [10], [16]
B9. ICT awareness	[11], [12]

1. Access to ICT

According to reference [12], "evidence from the literature suggests that the main factors limiting Indigenous adoption of ICTs are not rejection of Western values imbedded in the technology. Rather, access represents the greatest barrier. Access issues include the high cost of the technology, lack of adequate telecommunications links to remote communities and poor computer literacy together with the difficulty of improving computer skills".

According to [12], closely related to the issue of Indigenous adoption of computer technology is the ability of Indigenous people to access ICTs. Lack of equity of access is probably sufficient to explain the low adoption rates, without resorting to cultural arguments. There is no evidence that Indigenous people had any specific problems with learning and using technology, but there are major problems of access.

2. Computer Literacy and Ownership

Indigenous university students have poor levels of computer literacy, which is related to low computer use [12].

3. Availability of ICT based Indigenous Knowledge Content

According to reference [13], "even when access is available the media content often fails to address the specific needs and aspirations of minority cultures, in many cases just because it is broadcasted or printed in a language that is not their mother-tongue".

4. ICTs influence in IK transmission

Although ICTs [13] have been accessible, their influence on cultural transmission is patchy. Social interactions including church attendance have emerged as the principal means of transmitting culture to the younger generation, having more influence than media channels.

5. Communication Preferences

Reference [14] discovered that some people prefer face to face communication rather than information from the internet. This is supported by [10] according to whom face-to-face communication is the preferred form of communication, and is considered vital to indigenous individuals, and it can reduce the likelihood of ICT adoption by indigenous households.

6. Geographic Environment

Reference [11] reveals that the geographic isolation of many indigenous communities and the poor telecommunications infrastructure in much of rural and remote communities affect ICT adoption. As many indigenous peoples live in isolated rural areas [13], they lack convenient access to development support and to the means of communication that can provide such support. Libraries are often very far away from where they live and poor road infrastructure makes access difficult. Transport from far outlying communities is costly and there is very limited funding for stipends for fieldworkers who mostly come from the unemployed sector [15].

7. Purpose of ICT Use

A purpose to use ICTs [10] is a reason to adopt ICTs into the Indigenous household. As it was found that, researching Indigenous culture and family is one of the primary purposes for indigenous households to use ICTs in the home.

8. Education And Socio-Economic Status

The use of ICTs [10] in everyday life such as at work and at school, influences ICT adoption by indigenous households. This is because children who use ICTs in education exert a motivational force on their indigenous households. According to [16], socio-economic and educational backgrounds play a significant role in how people perceive and relate to local and foreign media products. On the other hand, a study by [2] found that, education and exposure, especially of the young generation to modern training, have biased people's attitudes towards using IK. Educated people despise some indigenous methods referring to them as ineffective and dirty.

9. ICT Awareness

According to [12], there is no evidence that Indigenous people have any specific problems with learning and using technology, but there are major problems of awareness. Reference [11] suggests that individuals need to first be aware of and then motivated to want to use ICT and, subsequently, that it is important that individuals and groups are able to identify value in its ongoing use.

C. Fitting the identified factors with the reviewed ICT Adoption Theories

This section presents how the above mentioned Indigenous Knowledge ICT adoption factors were fitted in each of the ICT adoption theories for households.

1. Fitting factors in the Model of Adoption of Technology in Households

Fig. 4 shows that it possible to model Indigenous ICT adoption factors according to MATH theory.

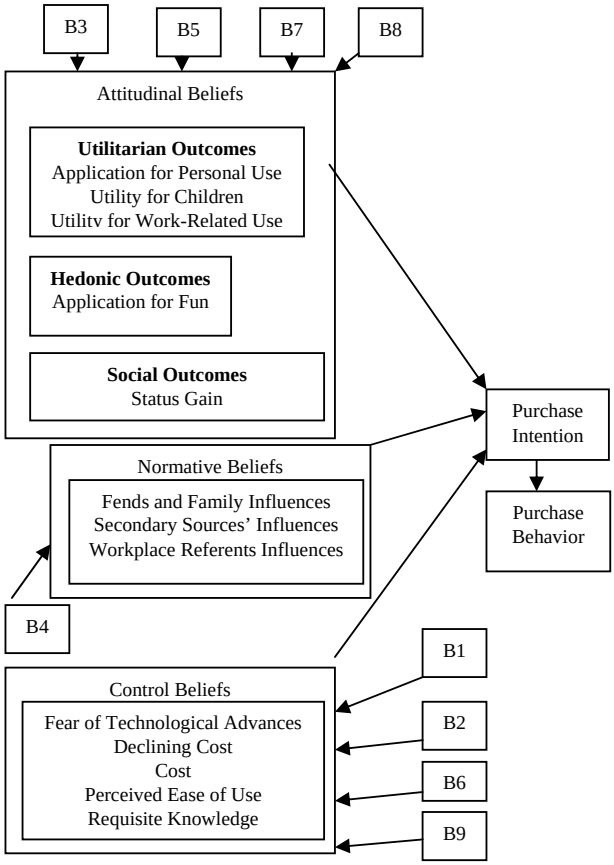

Fig. 4 Extended model of adoption of technology in household

2. Fitting Factors in the Household Internet Adoption Model

Fig. 5 shows that it is possible to model Indigenous ICT adoption factors according to the household internet adoption theory. However communication preference and the purpose of ICT use factors are still questionable.

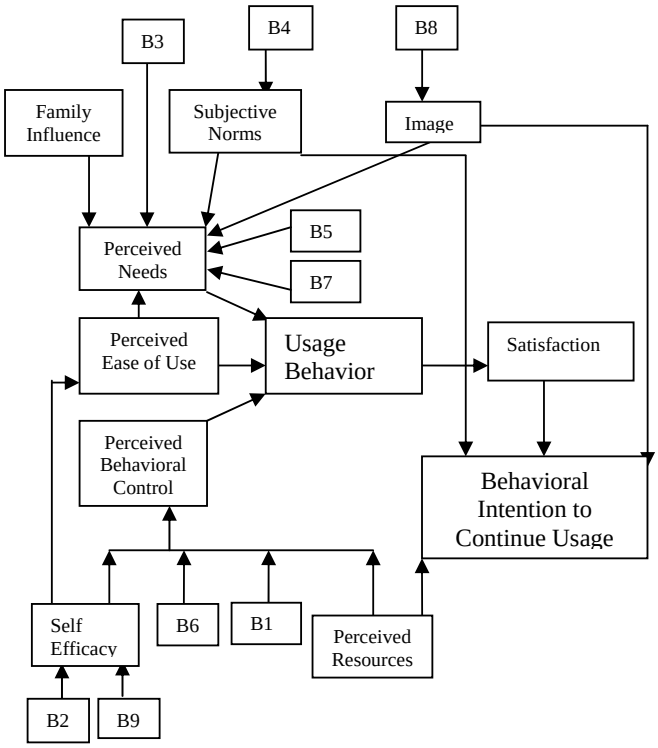

Fig. 5 Extended household internet adoption model

3. Fitting Factors in the Indigenous Household Adoption Model

Fig. 6 shows that it is possible to model Indigenous ICT adoption factors according to IHAM. However availability of ICT based IK content and old habits of ICT usage factors are still questionable. Although ICT awareness factor is indicated as an impact in education field, it is also been confuses with indigenous field.

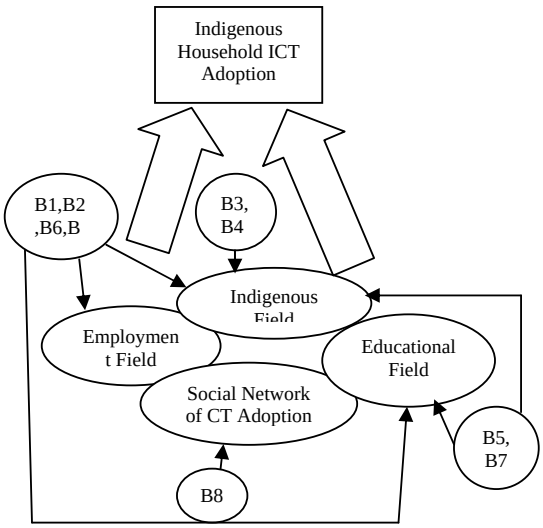

Fig. 6 Extended indigenous household adoption model

D. Modeling of ICT Adoption Factors to Preservation of Indigenous Knowledge

When matching ICT adoption factors for preserving IK with general household ICT adoption theories, it was reached that ICT adoption factors in IK can modeled using the Model of Technology in Household (MATH) by extending this model with identified ICT adoption factors.

VII. Discussion and Conclusion

In this paper, the research was conducted on the existing theories based on ICT adoption and then review of the factors affecting ICT adoption for the preservation of IK. These ICT adoption factors are then matched with reviewed theories with the aim of identifying the best suitable theory for analyzing factors that affect ICT adoption in preservation of IK. This paper contributes to the body of Indigenous Knowledge management by developing a theoretical framework of indigenous knowledge ICT adoption. The application of the MATH variables was found to be statistically significant for adoption of ICT in preservation of IK.

References

[1] P. Ngulube, "Managing and preserving indigenous knowledge in the knowledge management era: challenges and opportunities for information professionals," *Information development*, vol. 18, pp. 95-102, 2002.
[2] D. Akullo, R. Kanzikwera, P. Birungi, W. Alum, L. Aliguma, and M. Barwogeza, "Indigenous Knowledge in Agriculture: a case study of the challenges in sharing knowledge of past generations in a globalized context in Uganda," Durban, South Africa. http://WWW. ifla. org/iv/ifla73/index. htm, 2007.
[3] A. Chikonzo, "The potential of information and communication technologies in collecting, preserving and disseminating indigenous knowledge in Africa," *The international information & library review*, vol. 38, pp. 132-138, 2006.
[4] V. Venkatesh and S. A. Brown, "A longitudinal investigation of personal computers in homes: Adoption determinants and emerging challenges," *MIS quarterly*, pp. 71-102, 2001.
[5] S. A. Brown and V. Venkatesh, "Model of adoption of technology in households: A baseline model test and extension incorporating household life cycle," *MIS quarterly*, pp. 399-426, 2005.
[6] X. Zhang and L. M. Maruping, "Household technology adoption in a global marketplace: Incorporating the role of espoused cultural values," *Information Systems Frontiers*, vol. 10, pp. 403-413, 2008.
[7] S. A. Brown, V. Venkatesh, and H. Bala, "Household technology use: Integrating household life cycle and the model of adoption of technology in households," *The Information Society*, vol. 22, pp. 205-218, 2006.
[8] K. S. Al-Omoush and A. A. Shaqrah, "An Empirical Study of Household Internet Continuance Adoption among Jordanian Users," *IJCSNS*, vol. 10, p. 32, 2010.
[9] I. Ajzen, "The theory of planned behavior," *Organizational behavior and human decision processes*, vol. 50, pp. 179-211, 1991.
[10] P. J. Radoll, "ANU-Digital Collections: Stone Chips to Silicon Chips: A Grounded Theory of Information and Communication Technology adoption in Australian Indigenous households rural, urban and remote," 2011.
[11] A. Williamson, "Getting ready for e Democracy: A five-stage maturity model for Community ICT," in *The Australian Electronic Conference*, 2004.
[12] L. E. Dyson, "Cultural issues in the adoption of information and communication technologies by Indigenous Australians," in *Proceedings cultural attitudes towards communication and technology*, 2004, pp. 58-71.
[13] C. A. Harris and R. W. Harris, "Information and communication technologies for cultural transmission among indigenous peoples," *The Electronic Journal of Information Systems in Developing Countries*, vol. 45, 2011.
[14] S. AlAwadhi and A. Morris, "Factors Influencing the Adoption of E-government Services," *Journal of Software*, vol. 4, pp. 584-590, 2009.
[15] J. Sithole, "The challenges faced by African libraries and information centres in documenting and preserving indigenous knowledge," *IFLA journal*, vol. 33, pp. 117-123, 2007.
[16] J. Grixti, "Symbiotic transformations: youth, global media and indigenous culture in Malta," *Media, Culture & Society*, vol. 28, pp. 105-122, 2006.