2016

e-Competency of Practitioners: A Grounded Theory

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ABSTRACT

Competency in the use of ICT is enjoying renewed attention in the research and practice, but there may be a notable lack of a deeper theoretical view in this area of interest. This paper presents a grounded theory that revolves around three core elements namely: e-Competency Sets, e-Competency Acquisition, and Triggers. It is proposed that the practitioner possesses an e-Competency Set, consisting of three dimensions. e-Competency is obtained by engaging in processes of e-Competency Acquisition. These processes allow practitioners to acquire e-Competencies through the utilization of e-Competency Acquisition Resources and by following e-Competency Acquisition Strategies. e-Competency Acquisition is set in motion by a Trigger. This theory will also find application in a wide range of areas where e-Competency is a concern. The major contribution of this theory is a conceptually organized framework for traditionally fragmented ideas on e-Competency.

Keywords

e-Competency, Competency Acquisition, Information and communication Technology, Grounded Theory

INTRODUCTION

The notion of competency in the world of Information Technology (IT), Information and Communications Technology (ICT), Information Systems (IS), technology and software in general, is enjoying renewed attention especially in Europe. This is in part driven by the European Union with its European e-Competence Framework 3.0 (2014) targeted at ICT professionals as well as other publications such as work on Digital Competence Frameworks (Ferrari, 2014), which is targeted at, to be quite frank, everyone else. In these cases the goal is to create some framework which essentially consists of a list of competencies, and in some reference to levels of competency.

This paper presents none of the above, but rather a theory for describing the nature and acquisition of e-Competence of practitioners. It may well enrich the view that is taken by the "frame-work movement" since it considers the area of interest at a deeper theoretical level.

Since the purpose was to create theory, the process followed for achieving this aim is inductive in nature. The Grounded Theory Method was used and the process began without a specified research question or hypothesis, and rather with a clear focus on the area to be studied, that is: the e-Competency of practitioners. If a research question has to be stated, it could be formulated as: What is happening in the area of interest? For the more traditional reader a slightly more concrete research question could be: What is the nature of e-Competency? Some definitions are however useful in this regard.

The term ICT is used here as a collective for any kind of IT, IS, system, software or technology that practitioners use in their daily work environment. By using the term practitioners in this paper it limits the scope of the target group to people who use ICT in their work environment.

The use of the term competency is also a debatable and needs further clarification. Several definitions for competency/competencies have been found in the literature (Drejer, 2000; Garavan and Mcquire,2001; Jackson and Chapman, 2012; Oxford Advanced Learner's dictionary, 2001; Rowe, 1995; Savolainen, 2002; Wickramasinghea and De Zoyza, 2011)

However a debate on the clarification of the language can become endless. For the purpose of the proposed theory the term competency rather than competence was chosen, because within the data collected several references to less-than-superior competency emerged. These references could not be coded into a category labelled competence, which only suggests the ability to do something well as seen in the literature.

A combination of elements from the above-mentioned definitions presents a suitable way to ex-plain what is meant by competency in this research.

e-Competency is the combination of an individual's skill in using ICT, knowledge and under-standing of ICT, together with that individual's qualities, attributes, values, beliefs and attitudes that relates to how well he or she uses ICT to perform an activity within a function.

METHODOLOGY

Grounded Theory methods have become increasingly popular in the social sciences in the last few decades due to the rigor that it introduces in qualitative research (Wua and Beaunaeb, 2012). Grounded theory methods has its roots in symbolic interactionism between 1920 and 1950 (Robrecht, 1995). However sociological theory from such field studies was regarded as impressionistic or artistic rather than rigorous and scientific.

This changed as a result of the work of Glaser & Strauss (1967) who explain GTM as the discovery of theory from data, using the strategy of constant comparative analysis. Robrecht (1995) describes GTM as…"a method of constant comparative analysis based on the thesis that social sciences theory can be built from data systematically obtained in a social setting.

The main difference between the GTM and other research methods is the emphasis placed on generation of theory rather than verification. Their emphasis on generation, according to Glaser & Strauss (1967), came as a reaction to the overemphasis on the verification of theory during the 1960's.

Before the discussion turns to the research process that was followed however it is worthy to note the placing of the literature review in this research as well as the context for the research.

To minimize the influence that the frameworks, theories, and models of other researchers may have on the theory generation process, an extensive review of literature relating to the area of interest was delayed until after the basic framework of the proposed theory became stable and thus less susceptible to major changes. It will thus be noted in this paper that the explication of the proposed theory is accompanied by constant references to literature that are in some way related to the proposed theory.

It is thus important to note that the literature as it is presented in this paper does not constitute any addition to the theory but serves to contextualize and situate the proposed theory in current knowledge on the various elements that emerged from the data. This way of presentation of the paper reveals a major contribution of the proposed theory, in that it effectively brings together traditionally fragmented and still "disconnected" ideas on e-Competency into a conceptually organized framework.

The ever-modifying process of creating grounded theory was done using three coding procedures namely open coding, selective coding, and theoretical coding as described by Glaser (1987). In the project reported in the paper, the initial focus for analysis of the collected data was on open coding. Open coding is the initial process of studying each unit of meaning, naming it, and grouping it into categories (Urquhart, 2001).

Once the core categories emerged open coding became less prominent and a process called selective coding started replacing it, in which coding is delimited only to those concepts that relate to the core categories (Glaser, 1992).

For the purpose of this project data was collected from two organizations. The first one is a South African telecommunications provider and the second a government department in South Africa.

Two basic sources were used for data collection. Firstly documentation was used as a source, in particular for the purpose of understanding the history and current context of the participating organizations. Documentation included organizational reports, archival documents, and e-mails. Further data collection consisted of semi-structured interviews with 17 respondents with inter-view times ranging from 90 minutes to 3 hours.

FINDINGS (THE THEORY)

The three core constructs of this theory are presented in Figure1 and were named:

- e-Competency Set,
- e-Competency Acquisition, and
- Triggers.

The following three statements provide the central propositions that resulted from the theory generation process.

- Proposition 1: Any user has an e-Competency Set at any given point in time.
    - This competency set is a relatively stable condition or state and is referred to as a Base e-Competency Set.
- Proposition 2: The user periodically goes through a process of e-Competency Acquisition.
    - The acquisition of e-Competency is a process that takes place over time and is therefore dynamic in nature and leads to a changed competency set.
- Proposition 3: The process of e-Competency acquisition is set in motion by a Trigger.

- Triggers are neither processes nor conditions, but causal in nature as they cause the onset of a process of e-Competency acquisition.

The core constructs of this theory are different in nature and play different roles in the theory but they are, nevertheless, closely related as will be shown during the remainder of this paper. They are explained further in the following sections.

e-Competency Sets

One can, at any point before, during or after e-Competency acquisition, examine the e-Competence of users and describe them. This resultant description is referred to as an e-Competency Set and in general terms it describes the nature of a user's skill in using ICT, knowledge and understanding of ICT, as well as his or her qualities, attributes, values, beliefs and attitudes that relates to how well the individual uses ICT to perform an activity within a function.

The e-Competency Set is presented in terms of the three dimensions namely Function, e-Competency Level, and Personal Factors. The concepts and dimensions of the core category e-Competency Set, and their relation to each other is graphically depicted in Figure 1.

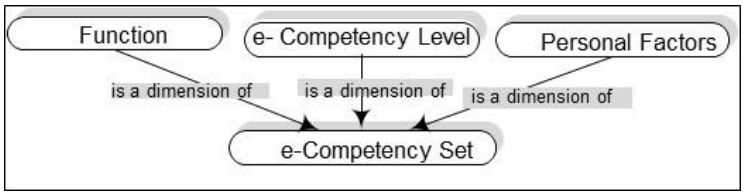

Figure 1. e-Competency Sets

The first dimension refers to the actions for which a person is used, or exists, in the organization, or in other words his or her purpose in the organization. This is in line with Miriam-Webster Online (2010). It is necessary to clarify that in the context of this research that it is assumed that when a person performs a function in an organization he or she fills a certain position in the organization, has responsibilities, and engage in activities that are relevant to this function. Many of the activities imply or require the use of ICT and the specific applications or features of this application are the ones that are relevant to the function of the user. The relationship between function and the supporting ICT used by a practitioner emerged when one senior administrator made a direct reference to this: "*... everything that I can do on (the system) relates to what my function is. That's where my competency lies*".

The second dimension of the core construct e-Competency Set is e-Competency Level and this simply refers to how well users are able to use IS. This dimension of e-Competency Set has two properties namely Competency Level and Competency Level Resilience. The former implies that Competency Level is something that can be rated (and by implication measured). A quote from the data reveals the implicit rating as an element of e-Competency Sets: "*I mainly use (ICT) for communication, but I would prefer to be able to use it more in the class-room, but my computer skills is not sufficient…*"

The end user literature reveals that various methods have been used to measure e-Competency. Rosennberg et al. (2009) developed an instrument that measures relevance and competency in technology use. Rivard and Huff (1988) proposed a typology and Winter et al. (1998) used paper-and-pencil test to collect information related to the user's knowledge about hardware and software. Marcolin et al. (2000) suggest that different approaches to e-Competency measurement is needed and they go on to illustrate how these different measures can be extended across multiple knowledge domains related to e-Competency.

The Competency Resilience property of Competency Level implies that a user level of competence is something that can be maintained over a period of time under certain circumstances. This means that a natural erosion, deterioration or loss of skill, knowledge or aptitude occurs over time, if certain functions are not exercised regularly. In the words of a manager: "*If you don't use the acquired skill regularly, if there is no reinforcement, you lose it*."

Drisko (2015) and Cheetham and Chivers (2001) highlight the importance of repetition, practice and rehearsal. Their research has shown that, what they refer to as "iteration" (which could be translated as repetition) plays an important role for professionals to reach proficiency in any particular area.

The third dimension of e-Competency Set is Personal Factors and this dimension contains three types of factors namely practitioners' Attitudes toward, Personal Attributes related to, and Beliefs about IS and the acquisition of e-Competence. Table 1 presents examples of quotes from the data relating each dimension.

Personal Factor	Quote
Attitude	*"Computers have never been my love."*
Attribute	*"I'm a naturally curious kind of person."*
Belief	*"Yes, yes (it) is very easy…"*

Table 1: Personal Factors

Attitudes to ICT have been studied extensively in the end user literature (for instance Compeau and Higgins, 1995; Davis and Bostrom, 1993; Jahawar and Elango, 2001; Kaushik and Rahman, 2015; Martins et al., 2014). The theoretical models that are used in these studies are often based on Fishbein and Ajzen's (1975 and 2010) theory of reasoned action. This theory proposes that beliefs about an object lead to an attitude about it and that this attitude leads to behavioral intentions regarding the object. These intentions would then influence the actual behaviors toward the object.

However the majority of studies focus on the relationship between attitudes and user adoption or acceptance rather than the relationship between attitudes and competency in the use of ICT. Sein et al. (1987, 1999) did however report results that indicate that positive attitudes towards computers can increase the likelihood that users will acquire e-Competence, which in turn should lead to higher e-Competency.

Finally the literature does offer some reference to existing research on the relationship between certain attributes and e-Competency. Sein and Bostrom (1989) report higher e-Competency in younger as opposed to older users. Another attribute that has been studied is that of learning style, most notably by Olfman et al. (2014) who found that learning style is a predictor of end user performance, in other words e-Competency.

An e-Competency Set can exist in one of two states namely a base state and a required state. In the theory proposed in this paper these states are referred to as a Base e-Competency Set and Required e-Competency Set respectively. The term 'base' as it is used here refers to an IS Competency Set that is relatively stable until an event occurs that causes a change in the competency set. The word "required" as it is used here indicates a competency set that is required, but not yet achieved, by the user to perform an action using ICT in support of the performance of a function. If the user's e-Competency has changed to such an extent that he or she can now utilize ICT better to perform an action within a function then the Required e-Competency Set can be regarded as a new and improved e-Competency Set. The Required e-Competency Set therefore becomes the new Base e-Competency Set until another change process is set in motion. Changes that may occur in the e-Competency Set occur in the Personal Factors and Competency Level dimensions of the e-Competency Set.

The term 'required' thus refers to the potential end result of this process of change in the competency set. This process of change is referred to as e-Competency Acquisition and this element of the theory is presented in the next section.

e-Competency Acquisition

e-Competency Acquisition has two sub categories namely e-Competency Acquisition Resources and e-Competency Acquisition Strategies. These sub categories are closely related, but will nevertheless be discussed separate.

The term e-Competency Acquisition Resources refers to the resources that are available to users to acquire e-Competency, and include resources such as online courses, the help desk, and col-leagues, friends and so forth. Resources that were identified were categorized as:

- Endorsed Resources, which refers to internal resources that are supplied by the organization such as training sessions, online courses, personal support, and so forth as well as approved external resources such as courses offered by public and private institutions.
- Non-endorsed Resources, which refers to resources that are not formalized or supported within or by the organization and may consist of colleagues, friends, and even family, as well as institutional resources that users may utilize on a private basis

The term e-Competency Acquisition Strategies refers to the various strategies followed by users to acquire e-Competence. There are three e-Competency Acquisition Strategies:

- Structured Training, which refers to acquisition of e-Competency in formal environments. These environments could be provided by the organization, or it could be external training attended by users either during or before their employment in the organization. A quote for the data reveals an example: "I did a few in-house courses."
- Self-teaching, which refers to e-Competency Acquisition Strategies followed by users where no support from the organization, people or other institutions are involved. A quote from the data reveals an example: "I don't know how to handle the whole (software), I taught myself, I've never been on a course…"

- Soliciting, which, put simply, is the act of asking someone for help. A quote from the data reveals an example: "But there is always someone you can ask, I want to do this quickly, how does this work."

The layout of the core category e-Competency Acquisition is depicted in Figure 2. As can be seen the data also revealed that the choices made by practitioners regarding e-Competency Re-sources and e-Competency Strategies are related to their perception of the Effectiveness and Cost (in terms of time) of the resources and strategies.

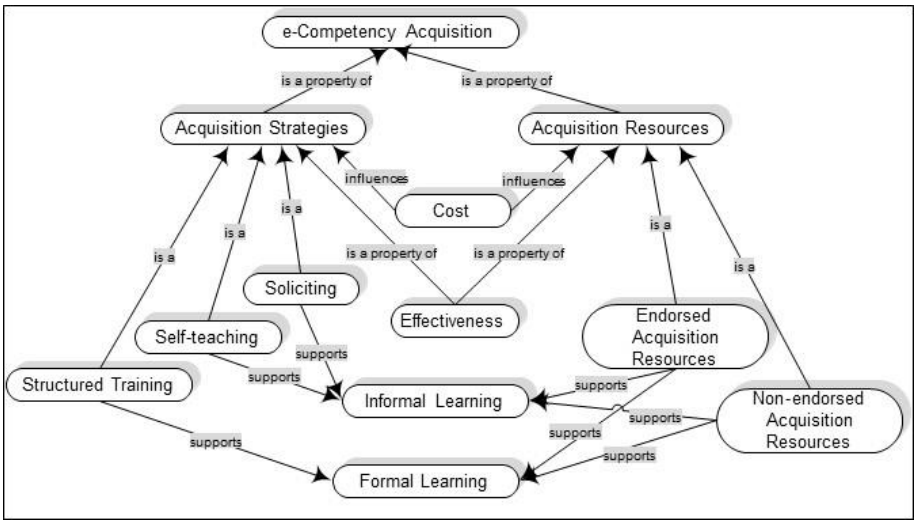

Figure 2. e-Competency Acquisition

Figure 2 also depicts the relationship between learning and the strategies and resources that are used to acquire competencies. A distinction is made between formal and informal learning and this distinction can be explained in terms of structure and control (Cheetham and Chivers, 2001 and MacNeil, 2001). Learning that takes place in less structured environments, where the learner has more control over the process, is more informal in nature. Learning that takes place in more structured environments, where the learner has less control over the process, is more formal in nature. It is thus possible, as Dodge (1998) and Lartey (2014) suggests, to envision a continuum of learning from formal to informal. Gorard, Fevre, and Rees (1999) define informal learning as learning that takes place outside a process of structured participation as found in formal educa-tion, or in terms of this thesis, Structured Training.

Triggers

As mentioned above, Triggers are neither processes nor conditions. They act to cause the onset of a process of e-Competency acquisition, thus bringing about a change in the e-Competency Set of the user. The concept of Triggers is a critical juncture in terms of this theory because the transition of a Base e-Competency Set to a Required IS Competency Set is contingent upon the onset of a process of e-Competency acquisition that is activated by a trigger.

Broadly defined Triggers are events that cause the user to engage in a process of e-Competency Acquisition.

Examples of such events are a directive from the organization, errors, or a decision by a user to engage in e-Competency Acquisition. Triggers can be categorized as either intrinsic or extrinsic to the user, and as being imposed or optional. However only three combinations of these categories are logically possible. They are listed with examples in brackets:

- Intrinsic optional (a decision by the user to acquire e-Competency). A quote from the data illustrates: "…and decided to learn to do the stuff myself"
- Extrinsic optional (making a mistake or getting stuck). A quote from the data illustrates this: "When I've done something wrong and I cannot get out of where I am, or it doesn't want to print or something then I'll phone the help desk."
- Extrinsic imposed (a directive or instruction by the organization to acquire e-Competency). A quote from the data illustrates this: "Now (the system) upgraded from 3.1 to 4.5, that is our newest version, and then I have to give training in that regard"

It is worthy to note that triggers are more likely to occur when certain conditions prevail. An ex-ample of such a condition is an upgrade of the organization's ICT, which increases the likelihood that, for instance, extrinsic imposed triggers will occur (for example everyone must go for training). Actual use of ICT by the user presents an example of a condition that increases

the likelihood that extrinsic optional triggers will occur (for example the user cannot get the system to produce what is required, thus he or she learns how to achieve the required result), whilst a user's high level of personal interest in and positive attitude towards ICT provide examples of conditions that increase the likelihood that intrinsic optional triggers will occur. Figire 3 presents a visual of Triggers.

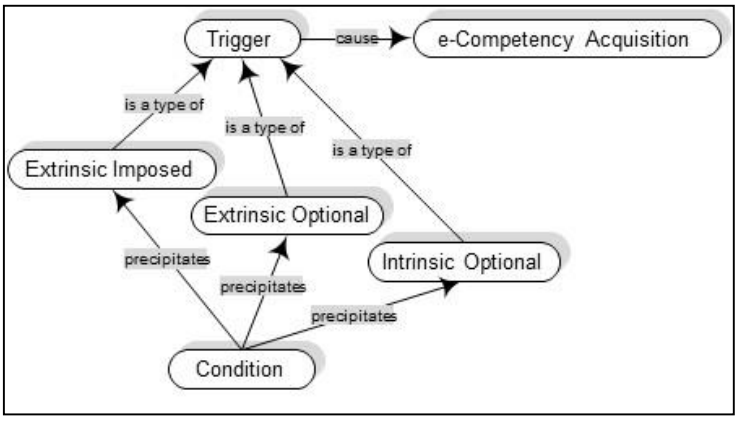

Figure 3. Triggers

A review of the literature revealed no direct references to triggering of e-Competency Acquisition as such. There are however references in other fields of interest that bear some degree of relevance for this element of the proposed theory. These include literature on learning as well as organizational change.

In the area of learning Kim (1993) suggests that individual learning takes place in a cycle, from observation to assessment to design and finally to implementation. Although not referred to as triggers by Kim (1993) it could be argued that the observation phase in this cycle could act as a trigger to learning,

Kolb (1984) also used the cycle idea in his work on experiential learning, suggesting that learning takes place in phases starting with concrete experience, then reflective observation, then abstract conceptualization and finally active experience. This idea is further explored by Ding et al. (2015) in the ICT environment, more specifically systems security behaviour. But the idea that learning takes place as a result of a trigger does not seem to be emphasized in this or other related research (see for instance Antonacopoulou, 2000; Baets, 1998; Drejer, 2000; Keogh et al, 2000; Roth and Senge, 1996; and Yoong and Gallupe, 2001)

Practitioners' performance in the use of ICT is lower when a new system is implemented (the change process), since they normally do not have the necessary skill to use the new system effectively. Organizations, of course, sense this and consequently try to avoid this decline by spending time, money, and effort on the preparation of users through training (Stair and Reynolds, 2001), or causing the onset of the e-Competency acquisition process. It can therefore be argued that the change process increases the likelihood that e-Competency acquisition can be brought about, in other words it creates a condition that makes it likely for triggers to occur.

CONCLUSION

The ISC theory presents four broad implications for future research on this topic namely its value for use as a basis for verification work, a source for new research on areas that have been neglected, a basic research model for future research endeavors as well as a frame of reference for the critical review of work done on this topic

Theories in general may not always provide definitive guidelines to practitioners until these theories have enjoyed some form of verification and testing through further research. This implies that guidelines to practice can only be general and putative in nature rather than specific.

It is reasonable to assume that organizations are keen to ensure that the workforce remains competent in the use of ICT and would be interested in responding to e-Competency challenges in a planned and productive manner. Structured Training remains an important way to attain in-creased user competency. However the organization also needs to have a view of the other IS Competency Acquisition Strategies that allow users to learn about IS, as well as the IS Competency Acquisition Resources that are required. Even more importantly a view on the conditions that make it more likely that Triggers will occur that cause users to acquire IS competencies in ways other than Structured Training would provide the organization with strategic information about when and where Structured Training would be more useful.

The proposed theory can inform the e-Competency development strategy of the organization on a broad scale. The notion of e-Competency Sets in particular is significant if used as a frame-work or foundation for the development of diagnostic tools that would help to determine the required e-Competencies of practitioners, how these competencies should be developed, as well as where resources should be deployed by the organization to support the development process. Following are some issues that need consideration for this purpose.

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