Methodology in computing education research: a focus on experiences

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Abstract

Over the past several decades, particularly since it was adopted by the IT industry in the 1980s, industry certification has expanded into a multi-billion dollar business (Cosgrove, 2004). But is it a pedagogically robust form of credentialing? Does it have value to those who hold such certifications and to the industry they represent? A current study using both phenomenography and Interpretive Phenomenological Analysis (IPA) suggests that, if well designed and well administered, such certifications are indeed pedagogically sound, with significant value. It is therefore argued that such a credentialing system can be used for teachers and analysts of SoDIS (Software Development Impact Statements).

Keywords: Computing education, industry certification, professional certification, interpretive phenomenology, IPA, phenomenography, SoDIS.

1 Introduction

In this paper I outline the methodology used in a study of the value and pedagogical robustness of industry certification, and the applicability of such a certification to teachers and analysts of SoDIS® (Software Development Impact Statements). The methodology focuses on the *experiences* of actors within the phenomenon that is industry certification. First, *phenomenography* focuses on the essence of actors' understanding and meaning constructions of industry certification. Second, as a joint methodology, *Interpretive Phenomenological Analysis (IPA)* with a focus on the essence of the phenomenon of industry certification itself. At the time of writing a comprehensive literature review has been completed, coded, and written up. While empirical data is yet to be collected from interviews with a small sample of certification holders and employers of certification holders for triangulation purposes, enough data has been collected in the literature review to present some preliminary and relatively robust findings.

In this paper I will outline the research methodology adopted, the methods of data collection and methods of analysis, along with some preliminary findings.

2 Industry Certification

Certification sponsored by industry (industry certification) has been a form of credentialing for decades. In 1938, due to a need for a common approach to testing, the Association of Short-circuit Testing Authorities (ASTA) was formed, along with ASTA Certification Services, with the support of the then UK Government Department of Scientific and Industrial Research (ASTA BEAB, 2004). The Institute of Certified Professional Managers (ICPM) Certified Manager claims a 30 year history ("ICPM offers manager credential", 2005). Novell, Inc. began testing and certifying IT industry and IT network professionals in 1986 (Cosgrove, 2004; Novell, 1996). Global certification testing centres were established in 1990 by Drake International (now Thomson Prometric) (Foster, 1997). Novell claimed their one-millionth certification in 1995 (Novell, 1996).

Industry certification has become a veritable juggernaut (Hitchcock, 2005), a "multi-billion dollar business" (Cosgrove, 2004, p. 486), with the number of available certifications impossible to quantify (Knapp & Gallery, 2003). The dynamics that drive it derive from a diverse range of stakeholder groups (Hitchcock, 2005):

a) certification candidates seeking to enhance their knowledge and skills and attain higher status and remuneration

b) the certified professional community who seek to raise the bar of their universal competency levels and forming a communications link between vendors and consumers

c) industry seeking to raise the overall knowledge and skill levels within itself

d) employers who seek ways to better qualify job candidates' credentials

e) consumers who demand knowledgeable and skilled professionals

f) product vendors who demand highly competent technicians implement and support their products

g) professional associations setting minimum standards and advancing their profession.

Additionally, many academic institutions are integrating industry certification in their curricula.

As a means of credentialing teachers and analysts of SoDIS, a SoDIS industry certification was mooted at the December 2004 SoDIS symposium held in Auckland. SoDIS is a process of assessment of ethics-based risk. A software development project includes three major phases in its initiation stage: feasibility analysis, formulation of functional requirements, and detailing project tasks. Each of these phases can introduce inherent risks to stakeholders. The purpose of the SoDIS inspection process is to identify the possible impacts to stakeholders of the risks within each of these phases. Project and software requirements are inspected for downstream impacts related to, for example, unfair discrimination of, the possible cause of harm to, and professional compromise to stakeholders and stakeholder groups, including the public (Gotterbarn, Clear, & Kwan, 2004).

In order for an industry certification to be a valid and valuable credential for SoDIS analysts and teachers, and likewise for any professional discipline, such a credentialing system must in itself be robust, reliable, and pedagogically sound. The resulting certification will then have value to its holders, as well as to the profession and its end users. Defining the ideal certification model, then, was the basis for the research.

3   The research methodology

The research examines both individual conceptions of industry certification and the phenomenon of industry certification itself based on the experiences and views recorded in literature of actors within the phenomenon. The research will be further informed by data from interviews with a purposive sample of certification holders and employers of certification holders, and from my own 10 years experience in industry certification.

This means that a *first-perspective* study of the phenomenon itself through experiences of the event, as well as a *second-perspective* study of the understandings of the phenomenon constructed through experiences within it (Marton, 1981) is being undertaken.

The methodology is within the interpretive paradigm. The interpretive world asserts that reality, and our knowledge of reality, are social products (Orlikowski & Baraoudi, 1991). The world is conceived as an emerging social process as an extension of subjective experience, and explanation of meaning is sought within the frame of reference of the actor rather than of the observer (Burrell & Morgan, 1979). The interpretive perspective attempts to "understand the intersubjective meanings embedded in social life … and hence to explain why people act the way they do"

(Gibbons, cited in Orlikowski & Baraoudi, 1991, p. 13). This research aims to interpret the social construction that is the phenomenon of industry certification.

Boghossian (2001) argues that a phenomenon is socially constructed if it is contingent on our social selves, that is it would not exist had we not built it, that it serves a social purpose, and we can freely reject it. Furthermore, Boghossian (2001) argues, we impose structure on it by social-construction talk. Industry certification would not exist had it not been conceived and built by social beings; it serves a social purpose - a credential for those actors who play a part; and can be freely rejected, by those who do play a part, including those who conceived of it and built it, and by those who choose not to play a part.

3.1   Text-based research

Due to the vast amount of literature found describing industry actors' perceptions of and experiences within the phenomenon, the research is predominantly literature-based. Valdes (1987) posits that there is no "interpretation of text that is so certain that no reasonable person would question it" (p. 57). He argues that the meaning of a text is derived from its make-up, which is; its form, its history, the reading experience, and the interpreter's self-reflection" (p. 60). Furthermore, he argues, a literary work "transcends the psychological and sociological conditions of its production and thereby comes into a new relationship that cannot be circumscribed" (p. 61).

According to Lee (1994), the meaning of text refers to what the author had in mind, but is not restricted to this. Riceour (1981) refers to a text's reference to a surrounding world, and to what is already socially constructed: what the socially constructed world is that stands behind the author's written words. Lee (1994) argues that the reader, upon grasping this socially constructed world standing behind the author's meaning, is not therefore independent but becomes an agent of that world and able to identify inconsistencies, and be able to transcend the author's own understanding.

3.2   Joint methodology

The first-perspective study as mentioned above requires Interpretive Phenomenological Analysis (IPA), since the focus of interest is the conscious intuitive individual experiences and personal perceptions of industry certification. IPA examines the essence of what is experienced, and extracts the *essential features of the phenomenon itself* (Smith, D., 2003; Smith, J., 1996). IPA recognises that different people perceive phenomena in very different ways depending on their circumstances (Smith & Osborn, 2004). This aspect of the research extracts individuals' viewpoints and how they make sense of industry certification by interpretation of accounts of experiences in order to understand the phenomenon itself, that is, industry certification.

IPA was developed in the 1990s by Dr Jonathan Smith who says that IPA recognises that it is a "process of interpretation by the researcher" (Smith, n.d., para. 1). Used extensively in health research, IPA examines the *experiences* of the patient in order to understand the condition (the phenomenon), and to draw on the researcher's own experience and conceptions.

For the second-order perspective, phenomenography is required, as the focus is the variation in ways that actors experience the phenomenon of industry certification and their resulting belief construction (Booth, 1997; Marton, 1986). Phenomenography extracts the *essence of the way industry certification is understood*.

Phenomenography appeared in publications in the early 1980s (Marton, 1981; 1986) as an approach to educational research that emerged from an empirical rather than theoretical or philosophical basis (Åkerlind, 2005). Phenomenography allows the researcher to focus on the variation in the ways the actors experience a phenomenon, knowing about it, having skills related to it, and the variations therein (Åkerlind, 2005; Booth, 2001). Its outcomes are the qualitatively different ways of experiencing a phenomenon, or meanings derived there from (Åkerlind, 2005).

4   Context of the Researcher

While phenomenology normally requires the researcher to stand aside from the data (Marton, 1986), IPA accepts that "each researcher brings particular concepts to the process of analysis" (Smith, Jarman, and Osborn, 1999, p. 554). Chapman and Smith (2002) state that "IPA recognises that the researcher's own conceptions are required in order to make sense of … [that] studied" (p. 126).

Phenomenography also allows the researcher to use their own experiences as data for phenomenographic analysis (Berglund, 2005; Säljö 1996; Uljens, 1996). According to Berglund (2005),

> the researcher himself (sic) – his beliefs, interests, previous experience, network of discussions, even personality, - is essential for the outcome of a project and become, to a certain degree, part of the results (p. 35).

The outcome of phenomenographic research, Berglund argues, is the researcher's interpretation of the actors' understanding, shaped by both the researched and the researcher (see also Säljö, 1996).

5   Methods of data collection

As stated earlier, the research is predominantly literature based. Interpretive text analysis methods assume that the meaning of text is subjective as the writer's expressions reflect their epoch and circumstances (Lacity & Janson, 2001). As the researcher, therefore, I have taken care to learn more about the writer of each text, taking into account the writer's situation.

Data will also be collected from interviews with a small, purposive sample. The research is further informed by my own life-world experiences within the domain which is the focus of the research.

6   Methods of data analysis

Phenomenography sorts the understandings of actors into specific categories of description which emerge from an analysis of the data collected (Åkerlind, 2005; Marton, 1981; 1986; Uljens, 1996). These categories (and the underlying structure) become the phenomenographic essence of the phenomenon (Uljens, 1996). They are, Marton (1986) contends, the primary outcomes, and the most important result, of phenomenographic research.

Phenomenographic categories are logically related to one another, typically by way of hierarchically inclusive relationships (Marton & Booth, 1997, cited in Åkerlind, 2005). The process, Åkerlind (2005) points out,

> is strongly iterative and comparative … involving the continual sorting and resorting of data plus ongoing comparisons between data and the developing categories of description, as well as between the categories themselves (p. 324).

IPA adopts a similar method of data analysis by grouping into broad interpretive categories which are then broken down into more specific themes (Reynolds, 2003; Macleod, Crauford, & Booth, 2002). This research identifies hierarchical categories that describe ways of thinking about the phenomenon of industry certification.

Åkerlind (2005) addresses the issue of validity, saying that qualitative researchers "are still traditionally expected to address issues of … validity and reliability …" (p. 329). Validity in phenomenographic research asks how well the research outcomes correspond to human experience of the phenomenon rather than how well the outcomes correspond to the phenomenon as it exists in reality (Åkerlind, 2005; Uljens, 1996). IPA of the phenomenon itself, therefore, strengthens the validity of the phenomenography aspect of this research, as well as the overall research itself.

Åkerlind (2005) also addresses the issue of reliability, pointing out that seeking like interpretations from multiple interviewees is not appropriate for phenomenography research as interpretations are made on the collective, not on an individual, basis. IPA, I contend therefore, is likewise, as IPA similarly draws on the actors' experiences and personal perceptions.

A feature of phenomenographical data analysis methods is variance in practice, which includes variance in data sorting methods (Åkerlind, 2005). One typical method described by Åkerlind (2005) (and referred to above) is the sorting and re-sorting of interview transcripts into piles representing emerging categories of meaning. This data sorting method is likewise advocated by Berglund (2006). The data

collected from the literature review derives from interpretations of actors' experiences and perceptions of industry certification as recorded in texts. As I deemed it unworkable to physically cut up and sort these recorded experiences into such piles, a different data sorting method was adopted. Multiple readings of literature pieces were carried out to allow the categories of meaning to emerge and form a mental picture. The essence of what the literature contained was then written up as an annotated literature review. Open coding was then used to identify the broad categories. Lower-level categories (or themes) were then identified within each category using axial coding, and any further sub-themes were identified using selective coding for a more detailed analysis (Flick, 1998; Strauss & Corbin, 1990).

7 Hierarchy of categories and preliminary findings

Four broad categories of meaning emerged. These broad categories are:

1. Market and product conceptions (of the industry actors)

2. Programme models and assessment

3. Programme implementation and administration issues

4. Professionalism and recognition

Hierarchical sub-categories, or themes emerged from within each of these broad categories as follows:
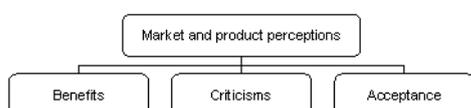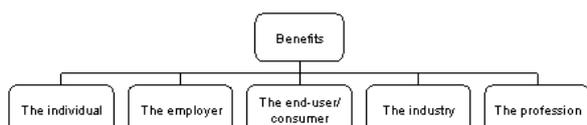

Fig 1. Categories hierarchy top level

Fig 1.1. Categories hierarchy second level

Fig 1.1a Categories hierarchy lower level

It is not possible to illustrate the complete construction of the categories of meaning hierarchy here. These examples serve to illustrate, however, the hierarchical and relational nature of the categories of meaning. One can see that a more detailed analysis of the lowest level of category illustrated (Fig 1.1a) will provide rich data to assess the value to the individual of industry certification.

A further finding required by the research is the pedagogical validity of an industry certification. The following model, developed from within this study and

stemming from the data within broad category 2, programme models and assessment, represents typical and non-typical elements of a certification programme:
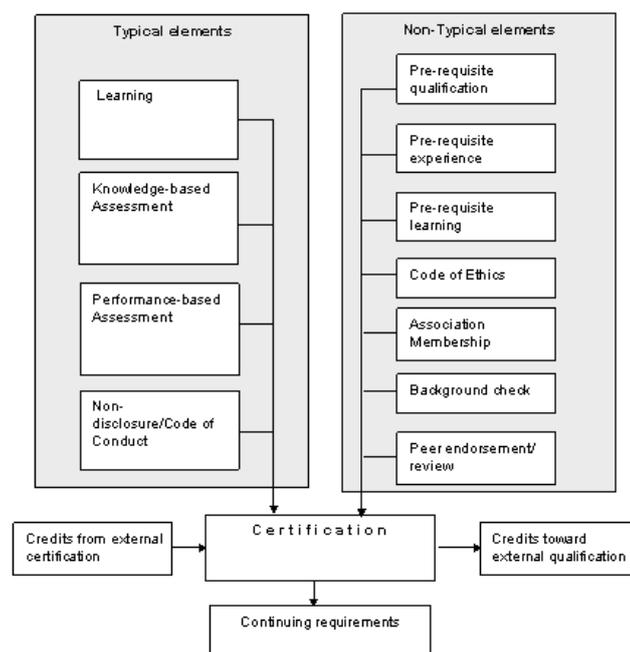

Fig 2. Typical and non-typical elements of a certification programme.

As mentioned earlier, at the time of writing, empirical data has yet to be collected from interviews. While the analysed data from the literature survey has not therefore been triangulated with the data that these interviews will generate, the data gathered from broad literature sources provides a rich, robust, in-depth picture of the industry that is industry certification. The findings are extensive and unable to be presented in their entirety here and have therefore been significantly condensed into this simple model. I contend, however, that one can glean from this model that the presence of all of the typical elements shown here, and with relevant non-typical elements included, that the given certification programme is rigorous and robust, and fits an accepted model of pedagogical validity.

Given that the associated assessment and administrative processes have rigorous, transparent elements of integrity and security, and these processes are robust, using this model a certification candidate or stakeholder may assess the certification for value and pedagogical validity. Fig 3. (following page) illustrates how the presence of rigour and robustness of the certification programme, performance-based elements, relevant non-typical programme elements, and integrity and security of assessment, compound to increase the value and pedagogical soundness of the certification. Additionally, the more rigorous the learning content, the greater the value and pedagogical validity.
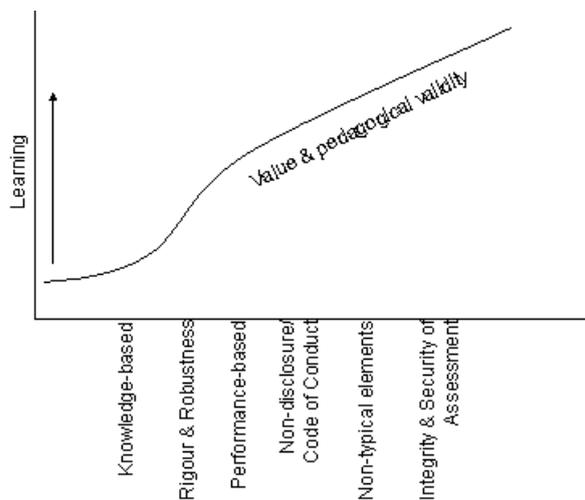
Fig 3. Scale of certification value and pedagogical validity

8   Conclusion

A joint methodologies approach has been adopted, first, to understand the phenomenon of industry certification *itself* in order to design and develop a programme with pedagogical and industry validity, integrity, and robustness. Second, to understand how participants *experience* industry certification in order to adopt a programme that appeals to and has value for those prospective candidates for a SoDIS certification. As the researcher, I believe this joint approach is valid for the robustness of the research results. While both IPA and phenomenology normally carry out themed analysis on a small sample, I believe this research makes a reasoned variance. As this research is largely based on secondary-source material, from broad literature sources and rich in data, it is my conviction that higher levels of rigour have been attained from the multiplicity of experiences contained in the material than would be the case from close interviews with a small sample. Even so, data from a small purposive sample will further triangulate the research.

A further reasoned variance from prescribed methods of data sorting has been adopted by using coding to identify categories of meaning. According to Åkerlind (2005) however, *variance in methods* is a *feature* of phenomenography.   As IPA similarly adopts the identification of categories of meaning, the variance in methods within this research is considered justified.

This research does not attempt to claim that *all* industry certifications have value and are pedagogically robust, however the preliminary results provide the basis of a model to identify the elements of such a certification. The SoDIS SEPIA collaborative partnership group (Clear, McHaney, & Gotterbarn, 2004), therefore, will be able to design and introduce such a certification.

The comprehensive findings will be the subject of further papers once interview data has been collected and analysed.

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