Computing *'professionals'* in e-governance: Policy Implications

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ABSTRACT

If a health care delivery system can be compared to e-governance system, computing personnel can be equated with the medical practitioners.Extant literature on professional status of computing workforce is inadequate, especially in the context of e-governance. Present paper fills the gap by examining the Indian computing workforce. Four questions were delineated from the literature and examined using primary and secondary empirical data from India. The study indicates that the computing workforce is an occupation not a profession, and discusses the policy implications.

Keywords: Computing, Software Work, Profession, Occupation, India.

1. Introduction

The present paper examines an important segment of electronic governance, yet inadequately addressed by the extant literature, computing workforce. This workforce develops software that makes information and communication technology (ICT) functional. It is denoted by various terms like as software engineers, programmers, software professionals and computing professionals. The paper tries to examine whether computing workforce falls under profession or occupation. Such an examination gains currency when an e-governance system is compared to a health care delivery system, and computing workforce to the medical practitioners. There is no great difference in the amount of scrutiny required to employ genuine medical practitioners as ICT infrastructure providers. The medial practitioners are accepted as professionals both by the public and the state, but the professional status of computing is unclear. The paper attempts to fill this gap by examining the computing workforce in India. It concludes that computing work falls under occupation, and discusses various policy implications of such categorization.

2. Computing as a Profession

One of the earlier legal definitions is as follows: "A profession is a self-selected, self-disciplined group of individuals who hold themselves out to the public as possessing a special skill derived from education and training and who are prepared to exercise that skill primarily in the interests of others" (Klass, 1961). It is also defined that professions are special case of occupation groups that have acquired peculiar status and power in society, which they confer on their members (Esland, 1980). It is argued that profession is evaluated on the basis of its member's conformity to or deviance from particular traits or attributes such as prolonged education, code of ethics, general body of knowledge, sense of community of equals etc. Also, rewards of professional life are the products of conscious attempts by professionals or other patrons to extract economic and social rents from consumers or to exercise social control (Leicht & Fennel, 2001). Traditionally, professions (like medicine, law, and dentistry) received protection from the state, which are

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resultant of '… legal devices of exclusive licensing and certification for individual professionals, and accreditation or licensing institutions that train and employ properly credentialed practitioners. It shielded professionals from all-out competition with other occupations, and protected them from each other' (Freidson, 1983; p. 280). Hence, there is an increasing tendency among the occupations irrespective of national boundaries to assert professional status, though few succeed to attain the same.

Wilensky (1964), who has intensively studied structural process of professionalization, has identified typical sequences of events that lead to professionalization of occupation. The obvious first step is members of other occupation, by necessity, start working fulltime for a particular new occupation. As a consequence of the first stage, a question of training arises and it leads to establishment of training schools. Third stage is the formation of professional associations and defining of core tasks of the profession. In this stage, it is assumed that there will be inherent conflicts, on one side, between newcomers who come through established training and old members and on other side, members of other occupations. The next stage is political agitation for legal support for their profession. A demand for the certification and licensing are an integral part of acquiring authority at this stage. Finally professional association comes up with a formal code of conduct in order to eliminate the unqualified and also to reduce internal competition. Attributing professional status should not be understood as an internal problem of occupations, as there is constant power play between the state, the market and the profession to retain and regulate the status, which in turn has a significant impact on the society (Kulick, 2006), Hence the professional status of an occupation should be analyzed in the larger context of the society and its consequent effect on social, economical and political domains. It is important that ethical standards and competency of the professional while performing work are emphasized.

Freidson (1983), who intensively studied medical profession of America, gives us valuable insights about the social, political and legal significance of profession in contemporary society. For Freidson, a fundamental and consistent criterion that distinguishes profession from other occupations is the legitimate control or autonomy over their work (Orlikowski & Baroudi, 1988; Donaldson, 2008). Freidson set forth key characteristics that distinguish profession from other occupation or basis on which professional status of an occupation can be examined. They are:

- Special position of public esteem and trust enjoyed by an occupation.
- Competency gap between specialized knowledge and skill possessed by members of the occupation and its clients.
- Monopoly of members of the occupation over the capacity to perform tasks associated with their work.
- Autonomy over work and freedom from bureaucratic control.

Computing employees or programmers are predominantly portrayed as professionals, indicating their work as a profession in the popular media and policy discussions (for instance see, Dataquest, July 2006). This popular perception is also reinforced by the policy agents. For instance, IT Policy of Madhya Pradesh, the largest province/state in India (MP IT policy, 1999) states the following:

Large chunk of land (preferably more than 100 acres) near the airports of above four cities will be earmarked by the State for Information investment area. Composite townships with food courts, hospital, shopping mall, residential complex, schools, five star hotels, and other entertainment facilities for the *software professionals* will be allowed in these areas… (p.4, Italics added)

In addition to the policy documents and trade press, even the academic literature seems to adopt the dominant view. For instance, Fuller & Narasimhan (2007) highlight that:

For *IT professionals*, as members of the new-rich middle class in Chennai, consumption – especially in housing and children's education – obviously is important for their *class status* (p.135, Italics added)
There are few followers among the practitioners. For instance, Holmes (2000) mentions the term even in the title of the column, 'Fashioning the foundation for the computing profession.' However, there is a growing concern among the practitioners to recognize the computing work as profession and the need to enforce the strict code of ethics and to follow the standardized training programs across the countries (Denning, 2001; Laplante, 2005). Scholar-practitioners (see for instance, Laplante, 2005) who support the professional status of computing cite the evolution of medicine and argue that computing would become profession in near future.

Systematic studies that examine the professional status of computing are few. Though the extant studies (Duliba & Baroudi, 1991; Orlikowski & Baroudi, 1988) base their findings from non-computing organizations, they infer that computing is not a profession.

There have been efforts by the members to standardize their training and practices. On the global level, IEEE (Institute of Electrical and Electronics Engineering), through its Computer Society and ACM (Association for Computing Machinery) are in the forefront of organizational mobilization of highly scattered and diverse types of computing workforce (Denning, 2001; Laplante, 2005). In America, there are a number of organizations involved in organizing computing work. Even if there are some collective attempts, they have not culminated into a single state recognized professional organization for computing workers like AMA (American Medical Association) for medical practitioners. In America, Institute for certification of IT professional (ICCP), ACM and AITP have separate codes of ethics for its members (Payne & Landr, 2006). The existence of separate code of ethics in different organizations and the lack of their enforcement shows that computing work has not yet reached the professional status.

However, we do not have adequate knowledge on the other characteristics of profession as discussed earlier. The present paper fills the gap using the case of computing workforce in India.

3. Computing Workforce in India
The Indian ICT industry is well recognized for its significant contribution to global software exports. It has been widely accepted as a tool for national development by the policy makers, underlined by the policy initiatives of both state and central governments. The success of the Indian ICT sector is also being imitated by other developing countries as a tool for national development.

The Indian IT industry has grown rapidly from US$ 7.8 billion in 2001 to US$ 48 billion in 2007 (NASSCOM, 2005, 2008; Balakrishnan, 2006). If it is placed in the context of Indian economy as a whole, the contribution from IT sector increased from 1.2 percent in 1998 to 4.5 percent of GDP in 2005-06 (Chandrasekhar, 2006; NASSCOM, 2005, 2008). It is stated by Chandrasekhar (2006), 'the gross revenue from IT services was in 2004-05 about 20 per cent higher than the GDP generated in India's construction sector and almost three times as much as the GDP in mining and in electricity, gas and water supply' (p.79).

In addition to the revenue generated, the ICT sector has become one of the biggest job providers in private sector. At present, according to NASSCOM, the premier trade association for software and service companies, ICT sector provides direct employment to 1.6 million people and indirect employment to another 6 million. It is expected that in 2008-2009 ICT sector will provide 2 million direct employments (NASSCOM, 2005, 2008).

Along with the industry, ICT policies enacted by the state and central governments also reflect the belief

that ICT sector will, to certain extent, provide more employment and development opportunities. The state and central level ICT policies, establishment of Indian Institutes of Information Technology (IIITs) and measures to attract, promote and sustain investment in ICT, such as extensions of fiscal incentive, tax holiday, infrastructure development etc. endorse the belief.

In India, popular media and policy discussion portray computing workforce as professionals. In 2004, Directorate General of Employment and Training, Ministry of Labour and Employment updated the classification based on the international standards, and denoted it as National Classification of Occupations 2004 (NCO-04) (DGE & T, 2007). NCO-04 mentions three groups of computing employees in three divisions: computing professionals (Professionals, Division 2), computer associate professionals (Technicians and Associate professionals, Division 3), and secretaries and key board- operating clerks (Clerks, Division 4) (Duliba & Baroudi, 1991). It is not clear why these categories are called as professionals. In only one place, software work is specifically mentioned as 'software engineer' (code 2132.20, see p. DO2-12, DGE & T, 2007), but it gives a generic description which is not really useful to throw light on the problem.

NCO-04 is made available very recently and is not utilized by any of the existing published studies. NCO-68 is outdated and has been used in almost all the research studies and by the National Sample Surveys (NSS). For instance, Basant & Rani (2004) used 55th round of NSS data to show that the labour force is deepening. Also a recent document, April 2007, on employment and unemployment in Delhi (DE & S, 2007) used the latest available NSS data, 61st round which follows the NCO-68.

Attributing professional status to occupations without systematic analysis of the nature of work and workforce has far reaching implications. Moreover, problems related to career mobility, occupational hazards, and terms and conditions of work will be completely neglected. In the context of flattered organizational paradigm, incorrect professional label to occupations will deliberately prevent collective bargaining by the workforce Kraft (1977).

Even though a good amount of research studies are available on software industry in India, we have an inadequate understanding about the nature of workforce. Since understanding of nature of workforce and content of work has paramount significance in policy making, there is a need for a critical evaluation.

4. Method
The paper uses the primary data collected for an empirical study by the first author (Ilavarasan, 2004). Though the earlier study focuses on task fragmentation or labour process (Ilavarasan, 2008) and occupational classification, the data provides adequate insights for the present paper. The data was collected primarily from two software firms located in Bangalore city. Triangulation of methods, semi-structured interviews and questionnaire survey, was used to collect both quantitative and qualitative data. Data from a specialized trade press magazine, *Dataquest* is also used as supplement.

Using the Friedson's work, present study attempts to answer the following questions:
- Does computing workforce enjoy a high degree of public esteem and pride?
- Does computing workforce possess knowledge and skill that is acquired through formal professional education?
- To what extent has the computing workforce has monopoly over content of work?
- Is computing workforce free from external evaluation by members of other occupation?

5. Observations
5.1 Public recognition
The first research question focuses on public esteem and trust enjoyed by the computing workforce. Among the surveys conducted by various popular magazines, a job in computing organizations has been rated as one of the top ten jobs in India over last ten years. The ICT sector has been successful in attracting skilled manpower from other disciplines as well. A trade press report aptly captures the perception about the Indian industry as follows:

… (IT sector) started emerging as a role model for the country. IT professionals in India were one of the highest paid, on average, IT was the most sought after area at campus recruitments. … IT had the highest number of people to be nominated for civilian honors by the nation. IT leaders and news hogged the limelight in the media for the right and sometimes wrong reasons. IT was the biggest employment generator in the country. It was IT professionals who were traveling the most into and out of the country. IT captains were bagging global awards in business excellence. And as marriage bureau said, "IT grooms and brides command the highest premium today, after doctors and IAS (Indian Administrative Services) officers" (p.16, Dataquest, July 2006).

Public policies undertaken by the Indian government indicates strong support for the idea of ICT-led-development (for details, Ilavarasan & Gupta, 2007). Efforts encompass national wide e-governance initiatives as well. This infers the amount of trust laid on computing personnel to realize the projections.

Thus, it is clear that computing work receive public esteem and trust.

5.2 Entry and Training
The second research question implies two aspects of profession. One is that entry to computing work is restricted to Degree or Diploma in computing (computer science, software engineering etc). Second aspect, which is related to first criteria, is that, since employees possess required skills and knowledge through professional education, post-entry training at the employed organizations does not cover fundamentals of computing.

Based on data from 3006 employees, salary survey of a trade press magazine (p.29, Dataquest, September 2006) showed that only 49.4 per cent of employees possess engineering degree, 5.8 per cent possess MTech (Master of Technology) and 14.3 per cent of employees are from graduate and post graduate backgrounds other than engineering stream.

A qualification-wise breakup of fresher recruitment in 2005-2006 by trade press (Dataquest, July 2006) showed that 70 percentage of software work force possess BE (Bachelor of Engineering) or BTech (Bachelor of Technology) degree, and 10 per cent of employees posses ME (Master of Engineering) or MTech. A small, nine per cent of employees' posses BSc (Bachelor of Science) and 10 per cent are from 'others' category. Among the hired engineers, most of them are not from computing discipline. Data from Ilavarasan (2004) shows that only 33% have computing related degrees.

ICT firms have started hiring no engineering graduates as well. Dataquest-IDC salary survey 2007 (p.27) based on data from 2806 respondents, showed that though engineers constituted 49.4 per cent of software workforce as in previous year, more number of graduates and post graduates from general streams were hired compared to previous year (Dataquest, September 2007).The large companies already started hiring science graduates to fill manpower shortage. To quote:

Large companies are putting serious efforts to expand that pool- in the short run by *training science*

graduates to take up work hitherto performed by engineers. (p.6. Italics added) (Dataquest, 2008).

In the case of Indian Institutes of Technology (IITs), premier engineering institutions of India, more than 90 per cent of non-IT graduates migrate to the IT sector (Rao, 2006; p.215). Though large scale studies are long overdue, small scale studies (for instance, Ilavarasan, 2004; Upadhya & Vasavi, 2006) replicate the results. Indian computing workforce is composed of predominantly under graduate engineers, but not in the computer sciences discipline. Hiring of engineers is due to demand for four years of under graduation by the overseas clients during nascent stages of the industry (Arora et al., 2001).

Earlier research Ilavarasan (2004) reported that all computing employees are given both basic and specialized training by the employers. 'Basic 'training imparts all the fundamentals required to perform software work and the period ranges from 30 days to 90 days' (Ilavarasan, 2007). Since employees are from diverse educational background, fundamental knowledge becomes an essential part of post entry training. Also, specialized training is given to experienced employees on new technologies or domains, depending on the project requirements of the clients.

 Dataquest-IDC IT Best Employer Survey among 3006 employees listed various parameters of employee's satisfaction on the training (p.66, Dataquest, August 2006). Survey found that 62 per cent of employees strongly agreed with the statement that "The training given to me is relevant to the kind of work I do". Second statement "The training given in this company helps me in my professional and personal growth" was agreed by 63 per cent of employees. Dataquest-IDC IT Best employer survey 2007 (Dataquest, August 2007) also reported industry average of 61 per cent for both the parameters. It is clear that employees are highly dependent on post-entry training to perform the work.

Thus, the findings suggest that knowledge and skill required to perform computing work are not acquired through formal credentialed training. As a result entry to computing work is open to all irrespective of their education and training in concerned subjects.

5.3 Work Control
The third question raises the issue of professionals' monopoly over the content of work. Let's examine whether computing employees define and perform their work by their exclusive technical expertise.

Indian firms are typically software service firms, who developed or maintained software, depending on the contracted projects from clients. Computing work is performed in the form of project teams. In most of the outsourced projects, designing is done by the clients and executed by the Indian workforce. This specialized division of labour in the computing work is possible due to partial success in dividing conception work from the execution work (Kraft, 1977, 1979). Though Indian computing employees have freedom to comment on or modify the overall design of the project (Ilavarasan, 2004), most of computing work performed in India is typically low end, repetitive work (Arora et al., 2001; D'Costa & Sridharan, 2004). Also, post-entry, specialized training, are exclusively 'need' based. For instance, an employee who has been working on *Unix* based project might be asked to undergo training on *Microsoft* technologies. Thus an Indian computing employee will not have much control over his or her own technical expertise.

Secondly, content of work is not exclusively defined by individual employees, as the work is performed in the form of project teams. Individual members are assigned various roles in the project by the manager and not necessarily they will get the desired roles and technological domains (Ilavarasan, 2004). Thus, computing employees are like any other paid employees in the organization. They do not have control over defining their work and performing them.

5.4 External Evaluation

Fourth research question analyses system of evaluation of professional work. It deals with who evaluates professionals and their work.

Earlier research (Ilavarasan, 2004) shows that computing employees are periodically evaluated and promoted. A computing employee follows a predictable career path, developer → module leader → project leader → project manager. Then he or she becomes a branch manager, then country manager and so on. At every stage, an employee is evaluated by his peers and other, especially from human resources (HR) department. As the employee climbs up the ladder, he or she is supposed to manage the team and its members, and coordinate with overseas clients. Communication skills and people management skills are essential to go to the next level, which will be tested by the HR department which does not have computing technical expertise (Ilavarasan, 2004; Upadhya & Vasavi, 2008).

The personnel from the management category are not necessarily from computing discipline. Earlier research (Ilavarasan, 2004) also shows that 64 per cent of project managers are from non Computer Science discipline. Dataquest-IDC Best Employer Survey 2006 (p.70, Dataquest, August 2006) and Dataquest-IDC Best Employer Survey 2007 (p.89, Dataquest, August 2007) discussed about role of managers in employees satisfaction. 66 and 65 per cent of employees, respectively in both surveys, strongly agreed that "my manager genuinely cares about my professional and personal growth".

Also, acquisition of quality certifications like Capability Maturity Model (CMM) or ISO series requires that employees document their activities for future reference which is open for evaluation by external audit agencies (Ilavarasan, 2004; Upadhya & Vasavi, 2006). An employee's performance report is directly tied to the final success of the project as approved by the client. Thus Indian computing employees are constantly evaluated by the other occupations, indicating that computing employees are subjected to evaluation by other occupation.

6. Policy Implications

The paper did not find support for three out of four characteristics of a profession. Though computing personnel enjoy public esteem and trust, they do not control their own work, training, and under evaluation by others. Hence they cannot be termed as professionals or have not attained the professional status. In sum, the study finds that computing work is an occupation rather than profession. In other words, especially from sociological perspective computing personnel are similar to industrial workers or workers of other service sector.

The findings of the study have implications on various domains such as education, policy and industry. For instance, despite the work time is more than the stipulated time among computing employees, they are not governed by the industrial legislations, as the state treats them as professionals incorrectly. Industry's projection of flattered organizational hierarchy and identification of employee's as transnational citizens become the major reasons for failure in organizing the employees in this sector (Sandhu, 2006). Projection of "global corporate culture" and "individualization" of workers resulted in new management practices which deliberately prevent workers from collective bargaining (Upadhya & Vasavi, 2008). It also neglects terms and conditions of work such as employment security, dispute redress, work time, career mobility and other welfare measures available to other occupations in India.

Over dependency on the foreign markets with no spill over effects in the domestic market (D'Costa, 2003), makes the Indian computing workers more vulnerable to external market conditions. It has already been proved that Indian ICT workers are very less paid compared to their counter parts in other capitalist countries (Kumar, 2001). Since, ICT jobs incorrectly placed in professional category, manpower planning

and development educational reforms targeting IT jobs will result in adverse impact in the long term.

Recent policy initiatives of both state and central governments provide various measures to attract investment in IT sector. Some of them include development of infrastructure, providing land at nominal costs, uninterrupted power supply, fiscal incentives and exception from labour laws. A closer analysis infers that the measures are formulated from the view point of industry as employees are professionals rather than the workforce.

Planners of e-governance initiatives need to understand that the deployed ICT infrastructure is made up of personnel whose education and training is diversified, and subject to resultant risks. Hence responsibilities of the e-governance management team shall include monitoring of the computing personnel both in designing and maintaining the ICT infrastructure. Also, lack of enforcement of code of ethics by the computing community highlights the need of state interventions in regulations.

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