THE ECONOMIC AND TECHNICAL CONTEMPORARY PARADIGM AND THE TRANSITION TO WORK OF HIGHER EDUCATION GRADUATES IN ENGINEERING, MANUFACTURING AND CONSTRUCTION

Arlinda Cabral
CESNOVA – Centre for Sociological Studies in the Universidade Nova de Lisboa
Ph.D. Student / BA Educational Sciences /MSc Sociology
E-mail: arlinda.cabral@fcsh.unl.pt

Ana Mendonça
CESNOVA – Centre for Sociological Studies in the Universidade Nova de Lisboa
Ph.D. Student / BA Engineering / MSc Sociology
E-mail: ana.mendes.mendonca@at.gov.pt

─Abstract ─

The current scenario of greater economic difficulties and social uncertainties makes the professional area of «Engineering, Manufacturing and Construction» assume greater social importance, because they may be seen as professionals that can induce qualitative changes in the ways to produce, build and live in modern societies. The present paper focuses on graduates' in «Engineering, Manufacturing and Construction» transition to work trajectories five years after obtaining the academic degree, in an objective perspective, the career trajectories, and in what subjective relation to work - work centrality and work satisfaction - concerns, within a analytical regard to graduates' gender. Also, it is intended to present a conceptual and theoretical incursion of «competence model», bearing in mind socio-technical approach in the relationship between associating academic learning and key qualifications required by the labor market.

Key Words: *graduates' employability; socio-technical approach; work centrality; gender.*
JEL Classification: I23 (Higher Education and Research Institutions)

1. INTRODUCTION

Graduates' transition to work trajectories has attracted the interest of the academic community in the European context and in the Portuguese context (Verniéres, 1997; Alves, 2008; Chaves, 2010; Marques and Alves, 2010) due to structural and cyclical changes facing the job market and questioning the role of higher education in contemporary societies, which rely heavily on the «knowledge economy» (Giddens, 2004). In a context called «knowledge society», domain knowledge and technology become necessary tools for economic and social development of countries, with effects on living conditions of individuals. For this reason, in the context of work organization, with changes due to the convergence of several factors, such as internationalization and interdependence of economies, or the exploitation of technological advancement, one of the most characteristic group of professionals are those from «Engineering, Manufacturing and Construction» field, in which the balance of knowledge and technical skills allows the integration of human activities, attitudes and interests of the organizations they work with an emphasis on techno-economic paradigm (Freeman and Perez, 1988). In this sense, the perception of the relationship between skills acquired at university and those required by the labor market seems to point to the emergence of a socially constructed discourse in the workplace, with the analytical framework of the «modèle de la competence» («Competency Model») (Dubar, 2006, Boltanski and Chiapello, 2005). The present paper focuses on «Engineering, Manufacturing and Construction» graduates' transition to work. As it is a predominant «male field», we also aim to know, on one hand, if there are more resemblances or differences according to gender and, on the other hand, if there is a relationship between academic training and the skills more valued in the labor market. This study is linked to the Project: «Graduates' transition to work trajectories - objective and subjective relations with work» (PTDC/CS-SOC/104744/2008), supported by Foundation for Science and Technology (FCT), Ministry of Education and Science. The data were collected by inquiry by questionnaire, between November 2010 and February 2011, to graduates from two of the largest Portuguese public universities, the Universidade Nova de Lisboa (UNL) e Universidade de Lisboa (UL).

2. THE SOCIO-TECHNICAL APPROACH IN THE RELATIONSHIP BETWEEN HIGHER EDUCATION AND LABOR MARKET

2.1. The socio-technical approach

The origins of socio-technical approach in organizations emerge after the Second World War, and are the consequence of economic, social, political and cultural changing occurring in most developed countries, with implications for the functioning of organizations. We emphasize the idea that the socio-technical approach focuses on studying an intervention focused on the democratic participation of workers in organizations, like the socio-technical approach developed an analytical model based on balance and optimization of technical systems and social functioning within the organizations. In a sociological perspective of general systems theory, H. Spencer and T. Parsons reflected on the functioning of organizations as open systems and as a social organism, arguing that organizations tend to evolve from simple forms to complex forms that are at the same time homogeneous, heterogeneous and mutually dependent on each other. Because of this fact it is required institutionalized normative culture models (values, norms, roles, institutions) that define and guide the social order of civil society organizations, as well as the behavior of groups and individuals (Trist, 1981). Considering organizations as open systems, they depend on the surrounding environment and they consist in social systems characterized by culture, values, structures, rules and regulations. Organizations function as a system of roles, with specific characteristics, because they are made by humans, and possess material and technological resources that do not interact in a natural but human way. They also reflect attitudes, perceptions, motivations, beliefs, habits and expectations of human beings who work in them. In contrast to the neoclassical model, which conceives the world of work as populated by independente and self-motivated individuals, that make their decisions based on individual interests and preferences, the Marxist line emphasizes the class consciousness, the collective consciousness of class interests that emerges more or less naturally from the social relations of production (Trist, 1981; Ferreira, 2001). While Marxists now adopt a less deterministic and more interactive relationship between the economy and consciousness, they still argue that the perception of interests is powerfully shaped by the structural context of the economy.

2.2. From University to the labor market : the «competency model» and the socio-technical approach

The concept of competence is not yet consensual and stabilized. However, its meaning has been used as the articulation between knowledge, thought and action. Within this meaning, competence is «an asset added to knowledge: the ability to use it to solve problems, build strategies, make decisions and act in the broadest sense of the term» (Perrenoud, 2003:13).

The «competence model» (Dubar, 2006:97) was formerly approached in 1955 in France, launching a new perspective on work, which is understood as a problem solving activity, a model present in the work of Alain Touraine, *L'evolution du travail aux ouvrier usines Renault.* From the mid 1980's, in France, the «competence's logic» was developed simultaneously in work organizations and in certain segments of the education system. In the 1980's, the term «knowledge economy» (knowledge-based economy) (Giddens, 2004) emerges in order to draw attention to the fact that the production process is increasingly based on knowledge-intensive activities, featuring an economy in which the ability to learn is crucial to the economic success of individuals, regions, organizations and nations and to learn is to develop and acquire new skills, in addition to access to information. During the 1990's, there has to trigger the application of the model in French companies, as well as its expansion into the European context, resulting from different factors, such as: i) the emergence of the concept of «employability» (Dubar, 2006; Boltanski and Chiapello, 2005); ii) the strengthening of the neo-classical theory of human capital (Dubar and Gadea, 1999); iii) the changes in the working world - increasing rates of structural unemployment, acceleration of the working rhythm, the increase of the temporary work and part-time jobs, worker's versatility and flexibility (Boltanski and Chiapello, 2005).

The socio-technical approach emerges thus as a way to respond to the changes to work organization, based on the interaction between the technical and the social system. Obeys a different logic of Taylorism, which leads to the break with the principles of scientific work organization (partialization, specialization, the imposition of time, individualization, separation control/execution) for the creation of semi-autonomous groups of production characterized by the principles learning range, initiative, flexibility and engagement on the working, characteristics that are present in the above mencioned «competence model». The main representatives of this new organizational approach (Trist, 1981) defend the

company as a socio-technical system, where there are two major subsystems that are intertwined (the technical and social). While the system is determined by technological requirements of typical tasks that are performed on each organization, both in terms of skills or knowledge required by the type of equipment, physical structures and materials, factors that characterize all areas of «Engineering» group, the social system is made up of individuals and their interactions. Both are interdependent and influence each other. It this approach the socio-technical work system is analyzed as a whole - tasks, technologies, people and structures - assuming these as basic and interdependent variables for organizational change. For the first time, the organization is described as a systemic fact, where the individual rather than extension of the machine, complements the machine.

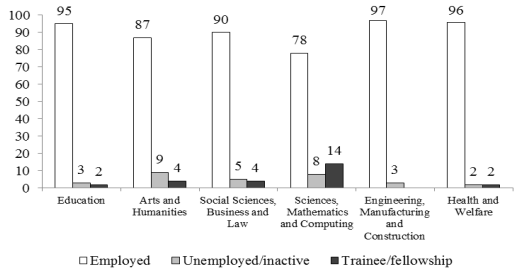
3. Transition to work of the «Engineering, Manufacturing and Construction» Graduates' of the Universidade Nova de Lisboa (UNL)

The sample consists of 1004 graduates of two major public institutions of higher education in Portugal, the UL and the UNL, equivalent to 22% of the universe (4290 individuals), with a maximum error of 15% for the confidence interval 95%. The overwhelming majority (94%) is between 25 and 35 year. Much of the sample (75%) are male, compared with 25% female. Data were collected by CESNOVA between October 2010 and January 2011. The sample is distributed by six fields of education: «Education» (n=100), «Arts and Humanities» (n=215), «Social Sciences, Business and Law» (n=241), «Sciences, Mathematics and Computing» (n=285), «Engineering, Manufacturing and Construction» (n=35) and «Health and Welfare» (n=128). In this paper, the focus is placed on the graduates in «Engineering, Manufacturing and Construction.

3.1 Objective relation to work

Overall, the vast majority of graduates surveyed are strongly embedded in the labor market five years after completion of training, being the area of «Engineering, Manufacturing and Construction» which has the highest percentage of employees (97.4%).

Figure-1: Work situation, by academic field (%)



Source: CESNOVA, 2011.

The engineers took an average of two months to get a paid job according to the academic degree and are the group that took less time to find work. They have the highest percentage of «Senior Public Administration» (27%) positions, strongly over-represented relative to the average (8%), which shows the connection between this field of education and the access to positions of greater responsibility. Engineers are mainly holders of «permanent positions» (71%), especially compared to the average (55%). They work mainly in private enterprises (62%) (average 50%). They are over-represented in weeks with 35-50 hours of work (65%) (average 59%). They earn €1420, more than average (€1300), being surpassed by the graduates' in «Health and Welfare» (€1.744) and «Social Sciences, Business and Law» (€1480). However, in what gender dimension concerns, one find that there are more men in permanent positions (65%) than women (56%), that both men (62%) and women (67%) work 35 hours per week, with an over-representation of male in 50 or more hours per week. Both men and women earn between €900€-€1800. So, it seems that there is no significant difference in the objective relation to work according to gender.

3.2 Subjective relation to work

The concept of «meaning of work» can be defined as the significance the subject attributes to work, his representations of work, and the importance it has in his/her life (MOW, 1987; Harpaz and Fu, 2002, Halman, 2001). But in our post-modern times we may associate the meaning of work to tree dimensions (Morin and al, 2007): a) significance of work, in what concerns its representations and its value from the subject's perspective; b) subject's orientation toward work, in terms of what he is seeking in his work and the intents that guide his actions; c) the effect of coherence, between the subject and the work he does, between his expectations,

his values, and his daily actions at work. In this way, we understand work centrality as «the importance of work and working in one's life» (MOW, 1987).The work centrality might assume two ways: absolute centrality, meaning the importance given to work in general terms and relative centrality once balanced with the importance given to other spheres of the social life: family, friends, sports, cultural activities, politics, leisure and religion (MOW, 1987). With regard to the subjective relationship with the work, the graduates in «Engineering, Manufacturing and Construction», the majority consider themselves satisfied with the work (89%), with 26 % refers being very satisfied and 11% declare that they were not satisfied with the work. For the vast majority (91%) of graduates in «Engineering, Manufacturing and Construction» work is an important dimension in life. On average, 60% of graduates give a lot of importance to the work in life, 37% important and only 3% consider work not important in life. However, in what gender dimension concerns we face some differences according to gender: men are more satisfied (96%) with work than women (77%), and 8% of male respondents' refers not being satisfied with work, number that increase for 22%, regarding female graduates. But when they are asked about work centrality, we find that both women (100%) and men (97%) attach great importance to work in life.

3.3 Academic learning and professional skills valued in the labor market

Graduates in «Engineering, Manufacturing and Construction» consider that the most developed skill in the undergraduate program is «critical thinking», which is strongly present in all areas of training. Engineers distance themselves from other graduates according to the fulfilment of «Mastering techniques and technologies» (77%), being close to «Health and Welfare» graduates (71%) and those from «Sciences, Mathematics and Informatics» (69%). The engineers are the only group to identify as one of the most developed skills «team work» (51%), which may refer to the need for collaboration and cooperation to carry out their functions. After five years of contact with the labor market, the engineers reported that the most valued skills are «critical thinking» (80%), followed by «team work» (78%), «decision-making» (78%) and ability to «planning» (78%), which appears to demonstrate that these act as a graduated ordinate network according to certain standards heterogeneous material (technical thoughts-team-work). This group emphasizes that the technical and scientific knowledge seem to be inseparable from the social and technical interactions. But such a structure of skills does not seem to deviate much from the skills developed at university,

«critical thinking» (57%), followed by «team work» (51%) and ability to «planning» (46%). You can forward the hypothesis that the courses in the field of «Engineering, Manufacturing and Construction» have a curriculum aimed at developing skills that are valued in the labor market, taking into account the specificities of the profession «Engineering».

3. CONCLUSION

Despite the increase in years of schooling, the number of graduates and the number of students attending higher education, as well as the diversification of the public who access this level of education, the graduates are those with the most positive trajectories for long time. However, the trajectories of graduates differ because of different aspects, starting with the academic learning field, the economic, cultural and symbolic capital graduates' have, the gender dimension, the opportunities available in the labor market, the qualification skills graduates' have when seeking for a job. These skills may be theoretical, technical, relational and behavioral, citing the need for coordination between man, technology and machine-mediated interaction with other individuals, which characterizes the socio-technical approach. This approach works as a system of social roles, with specific characteristics, as they are made by humans, material and technological resources that interact through human action.

In the present paper we confirm that graduates in «Engineering, Manufacturing and Construction», that obtained the academic degree in 2004/2005 and answered the inquiry five years after (2010/2011), maintain a very positive transition to work trajectory. Engineers are protagonists of successful career paths: take less time than average to get jobs, earn more than the average and hold employment contracts safer. They also occupy more management positions than other graduates, have the highest percentage employed individuals (97%), they earn more (€1420) than the average (€1300) and the majority holds a permament position (71%). Regarding the gender analytical framework, we find more resemblances than differences in transition to work trajectories: both men (62%) and women (67%) work average 35 hours per week; both men and women earn average 1420€. However more men are in permanent positions (65%) than women (56%). In what subjective relation to work concerns, one find that men are more satisfied (96%) with work than women (77%). But when they are asked about work centrality, we find that both women (100%) and men (97%) attach great

importance to work in life. This evaluation of work centrality seems to point to the work's linkage to a main financial source for economical support.

Taking into account the socio-technical approach, the actor-network theory and the competence model – such as communication skills and relationship, the engineers' group demarcates itself from other graduates, identifying as one of the most developed skills at university «team work», being the only group to have this feature. We intend to continue to study this issue, or deepen theoretically these issues through the application of qualitative research methods to understand the meaning for this group of your professional goals and their relationship to work.

Acknowledgements

This text is part of a doctoral program financially supported by Foundation for Science and Technology (FCT) (SFRH/BD/72273/2010), linked to the project «Graduates' transition to work trajectories: objective relations and subjective with the work» financed by FCT (PTDC/CS-SOC/104744/2008).

BIBLIOGRAPHY

Boltanski, Luc, and Chiapello, Ève (2005), Le Nouvel Esprit du Capitalisme, France: Éditions Gallimard.

Chaves, Miguel (2010), Confrontos com o Trabalho Entre Jovens Advogados: As Novas Configurações da Inserção Profissional, Lisboa: Imprensa de Ciências Sociais.

Dubar, Claude (2006), A Crise das Identidades. A Interpretação de Uma Mutação, Porto: Edições Afrontamento.

Dubar, Claude, and Gadea, Charles (1999), La promotion Sociale en France, Lille: Presses Universitaires de Septentrion.

Ferreira, João (2001), "Teoria Geral dos Sistemas e Abordagem Sociotécnica", (in: João Ferreira-Ed., Psicossociologia das Organizações,), Lisboa: McGraw-Hill, pp.49-75.

Freeman, Chris, and Perez, Carlota (1988), "Structural crises of ajustement business, cycles and investment behaviour", (in : Giovanni Dosi-Ed., Technical change and economic theory,), London: Pinter, pp. 38-66.

Giddens, Anthony (2004), Sociologia (4.ed.), Lisboa: Fundação Calouste Gulbenkian.

Halman, Loek (Ed.) (2001), The European values study: a third wave, The Netherlands: Tilburg University.

Harpaz, Itzhak, and Fu, Xuanning (2002), The structure of the meaning of work: A relative stability amidst change, Human Relations, No. 5, 639-667.

Marques, Ana Paula, e Alves, Mariana (Eds.) (2010), Inserção profissional de graduados em Portugal: (re)configurações teóricas e empíricas, Vila Nova de Famalicão: Edições Húmus.

Morin, Estelle, Tonelli, Maria, and Pliopas, Ana (2007), O trabalho e seus sentidos, Psicologia Social [online], vol.19, pp. 47-56. ttp://www.scielo.br/pdf/psoc/v19nspe/v19nspea08.pdf [Accessed 17.11.2011]

MOW - Meaning of Working International Research Team (1987), The meaning of working, England: University Academic Press.

Perrenoud, Phillipe (2003), Porquê construir competências a partir da escola? Desenvolvimento da autonomia e luta contra as desigualdades, Porto: Edições ASA.

Trist, Eric (1981), "The evolution of socio-tecnical systems, Issus in the quality of working life", Canada: Ontário Ministry of Labour.

Vernières, Michel (Ed.) (1997), L'insertion professionnelle: Analyses et débats, Paris: Economica.