

INFLUENCE OF THE ORGANIZATIONAL CONTEXT IN RESEARCH PRODUCTIVITY. A COMPARATIVE ANALYSIS BETWEEN A UNIVERSITY AND A RESEARCH CENTER

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Resumen

Las instituciones y los contextos laborales afectan el desempeño de los investigadores como resultado, desarrollan una serie de documentos y sus posibles efectos. Ello genera grandes interrogantes en la manera en que las instituciones pueden estimular la productividad científica: disponibilidad de recursos, clima organizacional, estrategias para su desarrollo, interacciones profesionales y el reconocimiento, entre otros. Sin embargo, este campo aún no ha sido explorado en nuestro país y en Latinoamérica, y no ha sido comparado el impacto que tienen las estructuras y marcos institucionales de una universidad y un centro de investigación en la productividad científica.

Palabras clave:

- Teoría de la organización
- Productividad científica
- Instituciones

Abstract

Institutions and labor contexts strongly influence the performance of research staff in many ways. As a result, a large body of research documents are produced among the relevant issues. This has generated many questions on the ways in which research institutions and organizations may stimulate scientific productivity, such as resource availability, organizational climate, professional interactions, recognition and development strategies, among other factors. However, this field has not been systematically explored in Mexico and Latin America, nor has the impact of different institutional frameworks on scientific productivity –universities compared to public research centers– been studied.

Key words:

- Organizational theory
- Scientific productivity
- Institutions

Introduction

The idea that university organizational structures influence the productivity of researchers is not new. Authors such as Berger (2002) have emphasized the need to learn more about how the organization affects individuals either by facilitating research or by creating challenges for its development. The availability of human and material resources for research, the concessions granted in terms of working hours and economic resources and incentives for multidisciplinary participation in joint projects, for example, determine the productivity of researchers. New, efficient research career models shape the training of new researchers and their productivity patterns.

When scientists move to a new institution, their production patterns soon respond to the prevailing levels and publishing standards in it (Hall, 1996, Creswell and Brown, 1992, Long and McGinnis, 1981), and working in high prestige departments or institutions increases productivity. The departments encourage and facilitate scientific productivity through motivation, an intellectually stimulating environment and good facilities. The research and development laboratories also influence their workforce (Coccia, 2004, Pelz and Andrews, 1976; Tushman, 1978).

Yet scholars not only work within the institutions, but have extensive contacts with other academic organizations and society in general. The formation of invisible colleges and research networks is of extreme importance to scientific productivity, science involves social cooperation and the profession's values and culture (Crane, 1969, Mulkay 1977, Hagstrom 1964; Merton, 1973). Scientists occasionally may think they work alone, but that does not mean they develop their ideas in isolation from the environment, social relations and the value structure surrounding their profession. Scientists interact with others, identifying problems and ideas that address collective social and intellectual interests, while looking to make contributions considered relevant by their peers.

The development of research capabilities requires intelligent efforts and varied strategies tailored to the circumstances of each institution. The behavior of a researcher is influenced by the demands imposed by the organizational structure, competition for resources, being subjected to rules, communication patterns and the design of objectives for working together. The objectives, implicitly or explicitly defined by the group, determine the decision patterns of its members, the groups created, consciously or not, set rules that govern their productivity and member work satisfaction (Arechavala, 1987).

This paper focuses on universities and public research centers, in the former research is a marginal component in the recruitment and duty assignment mechanisms for academic staff, as well as the resources to carry out their tasks. The university studied has done research for over 30 years, while

the research center originated in 2000. The project aims to identify and compare the influence of the organizational context in the scientific productivity of a public state university and a public research center belonging to the CONACYT (Science and Technology Council) network.

The objective of this research is to understand the processes by which variables of interest relate to contexts where research occurs (Silverman, 1993; Yin, 1989).

Data collection had three components: a) analysis of documents related to the changes, structure and performance of both organizations, b) interviews with administrators, researchers and support staff in order to learn about their constraints and achievements in terms of productivity, and c) observation of their work, their laboratories, their cubicles, the relationships among themselves and with other staff.

At the university 48 researchers were interviewed: those with different SNI (National Research System) recognition levels, and others without, those who serve as authorities or have administrative positions and others who do not. 43 interviews were conducted at the public research center, covering all of its staff, including researchers, technicians and administrators.

The interviews were semistructured, and were transcribed and coded using content analysis software Atlas/ti version 4.1. The process involves two stages: the first is the categorization of information: the identification and construction of categories from the identification of relevant topics and subtopics, their connections and Organizational Theory. Some of the variables worked were:

- Rules or restrictions perceived by members of the institutions. Generated both in the medium (science and technology policies, SNI rules, rules for financing), and by the institution (regulations, evaluation processes, incentive rules, promotion rules, etc.). This included policies that set the guidelines for financing projects and strengthening research activities, including the SNI. In addition, the norms for teaching, appointments, incentives and evaluations as well as human and material resources.
- Conflict: crisis perceived by the researchers, including threats, pressures, difficulties, problems, quarrels, competition, disappointment, stress, job security, time to be distributed between teaching, research, mentoring, administration, etc., and scarce resources and rules imposed by the institution.

The second step was the structuring or the creation of one or more charts or semantic diagrams of relationships between categories, the structures or networks of categories or codes were built to identify their associations. These networks made the interpretations explicit and strengthened the analysis and conclusions.

Results and discussion

Organizational structure, regulatory environment, organizational behavior. A loosely coupled relationship

Institutions are a social technology, with rules and instructions programmed for common situations (March and Simon, 1958). Scott (1988) defines the structure as what formalizes the rules that govern behavior, they are explicit and formulated for all roles, and relations between them are prescribed regardless of personal attributes and relationships among individuals who occupy positions in the structure. However, DiMaggio and Powell (1999) argue that although the rules and routines bring order and minimize uncertainty, the creation and implementation of institutional arrangements are rife with conflicts, contradictions and ambiguities. Institutions neither necessarily nor often are designed to be socially efficient, on the contrary, generally –at least the formal rules– are created to serve the interests of those who have sufficient bargaining power to develop new rules (Romero, 1999).

In the organizations studied there are organic statutes, regulations, academic staff, etc., that define the roles of individuals and positions within the structure, their rights and obligations. The contents of the interviews in the two institutions show how, in the perception of researchers, from the organizational structure, emerge conflicts that block professional development:

- The science and technology policies were issued with a lack of knowledge or understanding on the part of the federal government on how to support research and actually prop it up as a tool for development.
- External policies restrict scientific activity because their priorities do not correspond to the social reality in Mexico.
- The SNI does not consider disciplinary differences in the number of publications required.
- SNI's evaluation committees are highly centralized which favors institutions in the central regions putting the states at a disadvantage.
- CONACYT policies favor consolidated researchers and those from the area of technology, leaving the young to their own fate and basic research with scant support.
- Performance Agreements regulating research centers have contradictions as the pursuit of efficiency, along with external audits of spending, create problems in their growth and consolidation.
- Although the CONACYT pledged to allocate more seats to the research center that was studied for it to grow to almost double its size this pledge has not been met, and their criteria is not based on the logical implementation of goals but on negotiating.
- Although PROMEP (Teacher's Improvement Program) and CONACYT pursue similar goals, the two institutions operate without coordination and contradict each other's policies.
- PROMEP policies govern the activities of research professors, forcing them to perform multiple activities and subtracting time from research.

- The rules of the university studied are outdated and rigid, which does not correspond to the flexibility required for research.
- The rules for the exercise and distribution of economic incentives are unclear; there is discretion and uncertainty in the allocation of resources.
- The research center rules induce competition among researchers and this in turn creates tension among them.
- The rules to attain tenure at the research center have a high degree of discretion and uncertainty, which also increases tensions.
- Administration in the two institutions represents an obstacle that prevents involvement in research which proves that the institutions are not designed to be socially efficient, since the bureaucratic paperwork hampers their goals.

The differences found between the university and the research center are explained according to the institutional regulations that each one takes as a priority, and how they respond to them. The maturity of the organization, from its background and experience, is a central factor to configure the type of relationship they establish with their environment. There is a link between the consolidation of the institution and its ability to obtain resources.

In the relationship between formal and informal constraints there are symbiotic relationships between stakeholders and the institutions themselves, where stakeholder objectives are shaped by the institutional environment (Powell and DiMaggio, 1999). Implicitly it is understood that organizations work according to formal plans, coordination is routine, they follow rules and procedures, and actual activities are subject to formal structure requirements. However, several researchers (March and Olsen, 1986, Powell and DiMaggio, 1999; Weick, 1976) show that there is a huge gap between the formal and informal organization. Formal organizations are often poorly integrated, structural elements and activities are weakly linked to each other, and rules are often violated. According to Meyer and Rowan (1999) organizations may not formally coordinate their activities because formal rules, if implemented, would create inconsistencies. Therefore, individuals are allowed to develop technical interdependencies often informally in violation of the rules. In the interviews, the researchers mention some situations where we can see the gap between formal and informal structure.

- Research is a creative endeavor, for its proper functioning, it can not be subject to bureaucratic controls, rigid relations of hierarchy and subordination, and excessively detailed regulations.
- Research at the university has a marginal presence, and it is only given importance when its productivity is highlighted.
- This activity has no formal budget assigned, it must respond to grants offered by other agencies and meet their requirements. This is not mandatory, but the productivity of a researcher depends on it entirely.
- The recruitment and adjoining mechanisms at the university are not designed to foster research.
- The control and desirable behavior mechanisms are set by the incentives, researchers should have an outstanding production to obtain them.

- At both institutions we observe the formation of informal research groups that have more negotiating power than an investigator working alone. Some of their members participate in the evaluation bodies and committees, only to protect the interests of the groups to which they belong.
- Researchers have practical autonomy which allows them to decide how to undertake their work, where the only constraint is being accountable to the institution on a regular basis as well as to the agencies that provide the funding for their projects.
- In both institutions there are working groups composed of researchers and students. The umbrella group is the project leader. These are mostly incidental groups¹ formed with a specific purpose, and they conclude at the end of the project.
- At the university there are some consolidated groups that make up the graduate programs registered in the PNP (National Graduate Program), that form networks with other national and foreign researchers, and have obtained several awards based on their professional careers.
- Following the PROMEP policies the university has established official academic bodies, but their performance is mostly concerned with teaching rather than research.

Both institutions are evaluated according to form, rather than results. They protect the forms or structures in their medium as sources of legitimacy. They also use structures to reflect compliance with social and cultural expectations, boosting confidence in the myths that rationalize the existence of the organization (Meyer and Rowan, 1999) addressing the concept of myth and ceremony.

The conflict. The struggle for goals

The contradiction model (Hall, 1996) studies the restrictions faced by participants and their effects on productivity. This model does not require a consensus with the participants. Decisions have to be taken, but sometimes the consensus achieved for a particular decision is so tenuous that it is very short lived, and the decision is soon reversed. The contradiction model highlights the fact that the various stakeholders of an organization may have irreconcilable differences, and productivity for one can mean the opposite for others, such as with teaching, for example.

Different groups are affected in different ways by the decisions of the organization. Perrow (1991) argues that in organizations participants fight for values such as security, power, survival, discretion and autonomy, and a series of rewards. Organizations are formed by people who may share goals, but hold different needs and interests; control is never complete, and people

¹ Arechavala and Díaz (1996) characterize cohesive groups as those that usually begin with the initiative of a mover, they keep common goals in the workplace, generate a set of norms and values that distinguish them and allow them to operate and establish different roles referring to the institutions in which they formed. On the other hand, incidental groups differ from the first because their members join temporarily, their collaboration is provisional and occurs for specific purposes on projects that are limited in time. When the projects are completed or the objectives met, the group disintegrates.

will fight to assert their interests. The role of authority is to reduce, maintain or channel these conflicts, the most important being those that involve groups, since groups can mobilize more resources, obtain loyalty and set perceptions.

- a. *Organizations face multiple and conflicting environmental constraints:* In the interviews researchers describe how emerging environmental restrictions enter into conflict with each other, leaving the institution and the participant helpless; where each entity will respond depending on the information that is collected from the environment.
- b. *Organizations have multiple and conflicting goals* (Weick, 1976, Cohen et al. 1972). At the university respondents frequently mentioned that teaching leaves little time for research; being a member of many committees (teaching, academies, graduate studies, the laboratory, for research, etc.) overburdens their workload, affecting one of the most dynamic nodes of universities. At the research center there is a conflict between its mission and the need for productivity. It is intended that the projects are multidisciplinary, but the pressure to produce forces them to be mono-disciplinary.
- c. Groups and external stakeholders are multiple and conflicting:
 - In both institutions participants compete among themselves, there is professional jealousy to achieve one's own goals. This prevents collaboration and makes it difficult to assess the weight of contributions in papers. Scott (1998) argues that competition among professionals creates conflict and ambiguity increases.
 - There is also competition between the university and the research center. Aldrich (quoted by Hall 1996: 109) mentioned that the main factors organizations should consider are other organizations, given they compete not just for resources and clients, but also for political power and institutional legitimacy as well as for better social and economic status.
 - The discretion in the way internal and external groups manage themselves leads to inequities in the distribution of resources, infrastructure, hiring and/or spaces. The rules are not applied fairly and are not defined in a collegial fashion.
 - There are observed conflicts between values, interests and objectives pursued by researchers and steering groups. There is a lack of coupling between areas.
- d. *Organizations have multiple and conflicting time frames:* The research center is treated by the officials that supply resources as if it were consolidated, being pressured to achieve its goals, forgetting that it is a new space that has no sufficient infrastructure, buildings, researchers and resources. In the eyes of the respondents decisions are not made taking into account the time frames for achieving the goals, environmental constraints, and the historical situation of the organization.

The contradiction model emphasizes that there must be concessions from all stakeholders in terms of constraints, goals, resources and timeframes. Faced with limited resources, the order of concessions is based on power relationships and coalitions within organizations, along with external pressures.

The conflicts that appear in the two institutions go beyond the contradiction model. They arise due to lack of resources (March and Simon, 1958), lack of time for activities that are measured and by restrictions imposed by the legislation (job security, outdated rules, red tape, etc.). Scott (1998) and DiMaggio and Powell (1999) recognize that institutional constraints always leave a space for self-interest and improvisation to play out. For the interviewees this happens because of the discretion with which some groups or researchers are favored with resources, time, space, application of the rules; by professional jealousy, the pressure to show results, the burden of carrying out a certain type of work without the right conditions; and because of the high expectations participants placed on the institution, as well as overcrowding in the work area and job insecurity perceived by witnessing the federal government's lack of interest. A critical variable is job security.

Decision-making process: Bounded rationality allowing domination

Organizations have a set of internal demands or needs for carrying out their work processes. To meet these demands decisions must be made and alternatives selected. However, in everyday life men act as if they were following rules, they know how to do things, based on practical experience, reflective experience and norm guidance (Romero, 1999).

Respondents distinguish two main trends, institutional decisions and individual decisions. Institutional decisions relate mostly to obeying the guidelines marked by the environment, i.e. to do what the federal government dictates in order to get resources: to have accredited programs, postgraduates listed on the rolls, arrange academic staff in academic bodies, use CENEVAL's (National Evaluation Center, private NGO) tests for admission and graduation, etc.

In terms of individual decisions, researchers refer to what they have to do to have higher productivity, to maintain or abandon their jobs or to join a research group. To increase their productivity, they propose research projects to funding agencies, get the resources, work on the project and achieve results, they get students involved in supporting their research projects and increase their productivity. This sequence of decisions, is as if they were following the rules: knowing how to do things, and that knowledge includes practical experience, reflective experience and norm guidance. They should also do what the organizations require from them such as having a certain number of PhD and Masters students (for mentorships), teach at the undergraduate level, organize meetings of academic bodies (academies) to make decisions pertaining to curriculum subjects or lines of research, publishing, in short, to try to achieve the goals that the institution has committed to in order to obtain additional resources. They adapt their decisions to organizational goals (March and Simon, 1958), as the necessary information is provided to them for making the right decisions and contributing to the goals

of the organization. Institutions determine the behavior of actors (rules of engagement), which has political or social consequences.

An important implication of March and Simon's (1958) model, and the information found in the interviews, was that to change the behavior of individuals, it is not necessary to change the individuals, in the sense of changing their personalities or skills, training or human relationships, but to change their decisions' premises. Rewards and punishments (e.g. more or less pay) are used to shape decision-making premises. Therefore, it is important to have the ability to set the premises, to define norms and standards that shape and channel behavior, and also the power of intervention by the elites, to define appropriate models of political and organizational structure, which are then accepted without question for years to come (DiMaggio and Powell, 1999).

Decision making: A Change of strategies. The definition of strategies involve changes in the organization as a whole. The strategies try to resolve internal problems (often caused by external pressure) and respond to environmental signals.

Researchers who did not get funding might choose to: 1) change their strategies within the same set of rules, making it necessary for agents to have the ability to learn not only throughout the game itself, but from the experience of other players in similar games, 2) attempting to transform the institutional environment, depending on their bargaining power, influence and learning thereof, or 3) they can also do nothing and wait for the environment to become more favorable towards them.

Resource dependence is the obverse of power (Scott, 1998). In relation to the strategies that researchers introduce when they obtain no resources on their first attempt, and when they do:

- They group with higher-level researchers or other organizations to demand what they need. This is the case of budget and salary increases, where the university is grouped with others to request from the Congress a budget increase.
- At the research center they reformulate the project to fit the criteria defined by the organization (interdisciplinary, technology focus, etc.) or external financing program whereby securing a better evaluation.
- They diversify the funding sources upon which they rely (foundations, foreign organizations, etc.).
- They request from the institution itself part of the money they need to work.
- They ask for permission for an academic stay at another university (preferably foreign) and work with the resources there.

Decision making: Transforming the environment: A researcher with sufficient bargaining power can do the following: a) talk to the authorities and see how to get approval for his project, negotiate in a way that allows her to respond to some pressing engagements, b) talk to committee members to specifically learn how his project can be approved. As for the organization, it will negotiate with government authorities for more budget, more time, more contracts or infrastructure, etc.

Decision making: Doing Nothing: Doing nothing is also a decision and may involve waiting until the environment changes and becomes more favorable. This decision is made when there is no pressure from the institution and the researcher's job security is not at stake.

Institutions make successful choices (not optimal), prepared on the fly. According to respondents, decisions within the organization are made within the framework of established rules, but personal goals, values and expectations of the people within the organization will make them actively fight for power and resources.

The conflict is set at the heart of organizational life, and makes evident how the organization is not a finished but dynamic entity in which contradictions and ambiguities allow it to survive and evolve. Decision making is being constituted in the life of the organization effecting two key areas: the organizational structure and the reconfiguration of groups. This creates a cycle that is mediated by conflict where the following issues stand out:

- Decision making is defined by the set of institutional regulations.
- It is performed to meet the organization's operational needs. Stakeholders identify their priorities for growth and look for ways to meet them using the institutional constraints to their advantage, wherever possible.
- A centralized decision making exercise can be distinguished, as a pyramidal organizational structure (in the university) or departmental (in the research center), where although there are some areas with specific directive bodies, resources, distribution of work and negotiation are fundamentally the task of authorities.

A change in decision making depends largely on the bargaining power and influence that stakeholders develop, as well as their capacity for learning and changing their mental models and cognitive maps. Their perception depends on the information that political actors receive and the way in which it is processed, which is why it is closely related to the spreading and adaptation process of new knowledge to generate new routines (Romero, 1999). This is a time consuming process of learning, and bargaining, power and influence developed by actors or the change in their mental models. In this way, institutions and stakeholders trigger learning processes that will later be used in similar situations. }

Conclusions

Organizations have the ability to structure and restructure according to the results of the decision-making and political processes that are within their own limits. Organizations are not fully flexible, but controlling the environment and organizational structure, which is important to obtain resources and achieve important goals, is key for measuring their effectiveness (Hall, 1996: 296).

This paper attempts to explain how researchers try to combine external factors related to the organization, the institution, and the researchers themselves, to perform their activities, based on their perceptions and interests.

The results showed, on the one hand, that the research center is subjected to tighter controls than the university, but in the latter the various functions performed stand out, meaning there are other priorities besides research. While at the same time it has strong legitimacy as the most important state institution, which ultimately helps to stabilize and consolidate its functions. In the case of the research center its immaturity stands out, its survival against lurking hostile environments that dangerously turn it into an “easy target”, is coupled with the internal tensions that are generated. However, to counterbalance this it has world-class researchers who are doing their best to survive as researchers. The consolidation of institutions is central (Arechavala and Díaz, 1996), for it allows them to survive despite the restrictions posed by the environment. Although the university is an established institution, it bows entirely to government policies, given that it depends on public resources to operate.

The implications of this study may serve as a guide for scientific and technological development agencies, and for the managers of the organizations that carry out this work. An important point is that it is clear how policies affect science and technology and how scarce resources create conflicts within organizations. Institutional maturation of research capacity in the country requires a more intentional and intelligent focus, as well as a broader vision on the part of its authorities.

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