

## UNIVERSITY MANAGEMENT OF SUPPORT POLICY FOR SCIENTIFIC, TECHNOLOGICAL RESEARCH AND INNOVATION: ADVANCES AND LIMITS

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### ABSTRACT

This paper analyzes the facilitating and limiting aspects in university management of support policy for scientific, technological research and innovation at the Federal University of the Valley San Francisco Foundation (UNIVASF), from the theoretical perspective of organizational arrangements, leadership and management practices. Qualitative research was done, of the case study type, proceeding to documentary analysis, non-participant observation and interviews with managers of the research area. The data was analyzed through content analysis, using the Nvivo software. The results indicate as facilitating elements: institutional arrangements, institutional policies and relationships, and collaboration networks. The main limiters are the juridical, legal and administrative obstacles present in the management of financial resources of public universities.

**Keywords:** University Management; Scientific; Technological Research and Innovation; Organizational Arrangements; Leadership; Management Practices

### 1. INTRODUCTION

The Brazilian state has stimulated and promoted the generation and diffusion of new technologies, aiming to revert the current technological gap and to cast the nation into the international scenario (Rezende, Corrêa & Daniel, 2013). The timid participation of the private sector in this process of national scientific development, combined with the legal requirements

in the implementation of the resources, the transparency of acts and the accountability of results obtained, are structural factors that hamper research actions.

In Brazil, policies to support scientific, technological and innovation research are characterized by public funding and are aimed at promoting the training of researchers, encouraging the development of research by universities, research institutes and some high-tech companies. In this sense, we can see that there is a strong participation of the state and little participation of the private sector. This, on the one hand, has led the country to make progress in building a platform for the development of national research, on the other hand, has created some peculiarities, which deserve to be studied since results are still incipient in view of the persistence and increase of obstacles to the development of national scientific and technological research.

Such policies to be effective and, at the same time, to minimize the effects of dependence and bureaucratic dysfunctions, it is necessary to adopt management elements highlighted in national and international literature as a reference in university management of Support Policy for Scientific, Technological Research and Innovation (PCTI). Despite the need, national studies on facilitating and limiting elements of university management of Support Policy for Scientific, Technological and Innovation Research are still scarce. To fill this gap, it is necessary to analyze these research institutions in the dimensions of organizational arrangements, leadership and managerial practices.

Thus, it is a challenge to improve legal administrative and legal instruments, as they are also obstacles that are not overcome, both by administration science and by law, in the scope of public management. Even with teaching, administrative and financial constitutional autonomy conferred to universities, these institutions are subject to such meanderings, which in very little contribute to scientific and technological advance. Thus, this paper has as a research question: what are the facilitating and limiting aspects in university management of Support Policy for Scientific, Technological and Innovation Research at the Federal University of the São Francisco Valley Foundation (UNIVASF)?

The objective of this study is to analyze the facilitating and limiting elements in university management of Support Policy for Scientific, Technological and Innovation Research at the Federal University of the São Francisco Valley Foundation (UNIVASF). It is assumed that UNIVASF, created after the reforms and modernization movements of the

Brazilian federal public administration, presents characteristics of university management that facilitate the support to Policies of Scientific, Technological and Innovation Research.

## **2. ADVANCES OF POLICY SUPPORT FOR SCIENTIFIC AND TECHNOLOGICAL RESEARCH AND INNOVATION IN UNIVERSITIES**

Brazilian research dates back to a scenario of scientific stagnation at the beginning of the second half of the 20th century due to the absence of researchers and environment for the development of research. In order to try to change this reality, a set of national organisms and institutions was the starting point for transforming this reality, namely: the creation of the National Research Council (CNPq) and the Coordination for the Improvement of Higher Personnel Education (CAPES), created in 1951, to encourage and stimulate, on an ongoing basis, the individual actions of national researchers and students, as well as to promote the training of researchers and the expansion of research in the country (Bernardes & Andreassi, 2011; Rezende, Corrêa & Daniel, 2013).

In 1967, another important institution, the Financier of Studies and Projects (FINEP), was created as a research-financing instrument in the country. In order to conduct national policies related to science, technology and innovation, developed by those institutions and research bodies, the Ministry of Science, Technology and Innovation (MCTI) was created in 1985, to formulate the National Policy of Scientific, Technological and Innovation Research; planning, coordination, supervision and control of S & T activities; computer and automation development policy; national biosecurity policy; space policy; nuclear policy and the export control of sensitive goods and services.

In the period between 1999 and 2002, it was possible to identify advances by carrying out important actions aimed at supporting and investments in Science, Technology and Innovation Policies in Brazil, as well as stimulating the creation of ties between universities, research organizations and companies, aiming at the joint construction of solutions for major national problems, as well as support for private investment in Science, Technology and Innovation (ST&I) policies.

Despite ideological, political and economic divergences, many actions were carried out in the military period governments. However, the important steps towards broadening science, technology and innovation policies came as from 2003 to 2006. Following, there is a second moment of resumption of advance from 2007 to 2010. The post-constitution period of

1988 marked a strong normalization of science, technology and innovation policies such as the Law of Innovation, the Good Law and the Public-Private Partnerships Act (Da Silva, Bassi & Ieis, 2011).

The legal framework of innovation policies in Brazil goes back to Law n. 10,973 (2004), denominated of "Law of Innovation", because it presents itself as a legal instrument that provided advances in Brazil's technical progress. This norm establishes the bases for support and incentive to innovation as well as scientific and technological research in the productive environment. It is worth mentioning stimulus to the creation of networks and international technological research projects, as a favorable stimulus to the construction of specialized and cooperative environments of innovation. In addition, it authorizes greater freedom to enter into licensing and technology transfer agreements and contracts, stimulates innovation in companies, as well as the independent inventor.

As of 2016, the actions of regulating science, technology and innovation policies continue through the publication of Law n. 13,243 (2016), called the legal framework of Science, Technology and Innovation in Brazil, regulated by Decree n. 9,283 (2018). This normative framework and its respective regulatory decree create favorable conditions for greater interaction between universities, research organizations and companies in the development of ST & I, guaranteeing greater legal security in relations.

A stimulation environment for scientific and technological production in Higher Education Public Institutions, with the foment of institutional policies, converges to the necessary transformations towards the creation of knowledge and innovation producers, associated with the proliferation of information technologies (Bernardes & Andreassi, 2011). Therefore, the transformation of these institutions into innovative organizations capable of competing at the forefront of technical-scientific development, into the globalized and dynamic international environment stands out.

The stimulus to scientific and technological production has been accompanied by other transformations in the institutional, economic and cultural field in public and private institutions (Rezende, Corrêa & Daniel, 2013), as conception of new organizational arrangements and the implementation of innovations. These can be understood as a continuous process of technological production for the improvement and / or development of new products, services, processes and new business models.

### **3. ORGANIZATIONAL ARRANGEMENTS, LEADERSHIP AND UNIVERSITY MANAGEMENT PRACTICES TO SUPPORT PCT&I POLICIES**

We can observe that there is an intrinsic relationship between the intrinsic components of university management, referring to the following dimensions: a) organizational arrangements, characterized by appropriate organizational structure, multifunctional and interrelated team, alliances, organizational and inter-institutional collaboration and communication ; b) management practices, whose focus is quality and results; c) leadership promoting innovation, motivation, involvement in innovation, inducing organizational climate appropriate to innovation and organizational learning, as characterized below.

#### **3.1. Organizational Arrangements**

In the analysis of organizational arrangement perspectives, two environments stand out: external and internal of university organizations. In the external environment, relations and interactions in search of support and financing of policies for the promotion of Scientific, Technological and Innovation Research (PCTI) in universities are evidenced, as well as through the strategic support for joint research, and of the development for public and private organizations (Bernardes & Andreassi, 2011).

In the internal environment, relations between internal collaborators are highlighted through collaborative actions to disseminate knowledge, projects and organizational sectors related to the PCTI. This is evidenced by the ability to establish complex relationships through a wide network of information, knowledge, financing and access to new technologies, aiming to increase competitiveness and productivity, to achieve the desired results collaboratively (Theis & Schreiber, 2014; Faccin & Balestrin, 2015; Maccormack & Mishra, 2015; Schreiber, 2015).

In Brazil, the shared management of research between public institutions and companies is identified, establishing partnership and cooperation relations with university-business and local power, such as successful cases of collaborative integration between the Federal University of Rio Grande do Norte, Petrobras and local government. Organizational arrangements are structural alternatives for advancing scientific and technological knowledge in research institutions at national and international levels.

In this scenario, the following stand out: the formation of collaborative networks and of internal and/or interinstitutional partnerships, which are characterized as a strategic action

for network management, aimed at providing fluid relations between organizations and at national and international levels, as well as access to data, information, knowledge, specific skills and resources through multifunctional teams. The organizational arrangements can be characterized by actions of the institutional policy to support collaborative research among the various sectors, researchers and research projects in the university, as well as, in the external environment, the development of networks of relationship between the State, Companies, Foundations Research Institutes, Universities and other scientific, technological and innovation research organizations.

### **3.2. Leadership**

Organizational mechanisms highlighted by literature suggest leadership management practices that provide orientation and support to relationship and collaboration networks (Hage et al., 2008; Gritzso, Fوسفeld & Carpenter, 2017). In this strategic perspective of management leadership, we highlight leadership actions as actions capable of involving researchers, sectors, knowledge and research in the various specialties in universities. One of the examples of leadership is FAPESP's pioneering initiative to foster strategic leadership empowerment capabilities in the management of policies supporting scientific, technological and innovation research (Junqueira, Da Rocha Bezerra & Passador, 2015).

The main leadership characteristics desired in order to achieve strategic results are: encouraging the culture of collective learning, teams' autonomy and their integration, orientation, support and ability to work in groups. Thus, through these competences, one obtains maximum use of motivation to submit projects and obtain more resources, nourishing creativity and contributing to good performance of research results (Hage et al., 2008; Mishra, Chandrasekaran & McCormack, 2015; Schreiber, 2015; Gritzso, Fوسفeld & Carpenter, 2017).

### **3.3. Management Practices**

Management practices include: strategic plans, understood as management tools applied to university management in support of scientific, technological and innovation research policies, by identifying potentialities and risks, subsidizing strategic decisions to take advantage of opportunities and threats. These instruments are characterized by the adoption of plans, through flexible management decisions, aiming the development of scientific, technological and innovation research in university institutions (Wang, Wang & Wu, 2015).

Therefore, it is necessary to follow the referrals of strategic decisions made to control the results, according to organizational planning. In this sense, monitoring and evaluation of processes and results of the research projects are performed through a performance management system to maximize results, with lower costs and time, according to guidelines and strategies of research institutions.

Literature suggests a methodology for research and development projects planning, applying the following stages: identification of internal and external environments opportunities; development of potentialities; evaluation of opportunities and monitoring (Lee et al., 2011; Marafon et al., 2012; Valmorbida et al., 2014).

In order to identify environment opportunities, special attention should be paid to participation of the society, especially the scientific community, in the process of planning the organization's research activities, in order to contribute to socioeconomic realities, in which Research Institutions are inserted (Quental & Gadelha, 2000).

The phase related to control and, according to the precepts of economic theory and the studies of Chao and Kavadias (2013), identifies the need to create a performance metric, based on the relationship between the degree of investment and the volume of sales, considering a study at the level of private organizations. However, the authors emphasize that such a measurement instrument needs to be adjusted for each research, identifying the adaptation need of institutional adoption of this management tool.

Risk management in scientific, technological and innovation research consists in identifying and managing threats related to change impacts in the unpredictability environment of undesired results in the management of research and innovation projects. Thus, risk is understood as an event of possible negative impact on institutional and project results. Therefore, such inconsistencies can be monitored by measuring results (Saito et al., 2013; Wang, Wang & Wu, 2015; Shin, Lee & Yoon, 2018). In this sense, companies are directing their research efforts to innovate in products, services, and businesses (Chao & Kavadias, 2013).

In this context, the strategic alignment feature is highlighted in the internal environment, through the interdependence between the projects and strategic orientation in resource allocation, which can be understood as the strategic decision to interrelate projects with simultaneous executions, aiming at optimization of results through the management of

project portfolios in high-tech organizations. With this, it is possible to achieve results effectively and align institutional decisions of resource allocation, according to strategic direction of the financing body, towards an efficient financial execution, which will result in superior quality and less investment (Verma & Sinha, 2002; Verma, Mishara & Sinha, 2011; Saito et al., 2013; Carvalho & Dos Santos, 2015).

To group these strategic actions of interdependence and resource allocation, research projects portfolio management (portfolio management) is used, which occurs between basic and applied investigation, as well as between the different specialties. In this sense, institutions are differentiated in the grouping of these project portfolios, following the portfolio strategy adopted according to planning and organizational guidelines (Liao & Greenfield, 1998; Kim & Chen, 2018). This strategy aims to create an institutional environment of partnership and integration between departments, projects and research groups, to maximize results.

The strategic action of organizational knowledge management system is characterized as an instrument developed to retrieve, store in specific databases, and disseminate the integration of knowledge resulting from information produced by research and innovation projects in organizations, as well as the relationship with internal and external environments on new perspectives, solutions and technologies. Thus, the integration of the knowledge management system with the university management support of Scientific, Technological and Innovation Research Policies, presents itself as a strategic transformative management tool (Jordan et al., 2005; Park & Kim, 2005; Park & Kim, 2006; Schreiber, 2015).

Table 1 presents concepts, dimensions and analysis categories used in the theoretical framework of this research.

**Table 1: Synthesis of the theoretical framework (dimensions and categories)**

Concept	Dimensions	Categories	References
University Management	Organizational Arrangements	Organizational actions to support internal relationship networks	Hage et al., 2008; Theis & Schreiber, 2014; Faccin & Balestrin, 2015; Maccormack & Mishra, 2015; Mishra, Chandrasekaran & Maccormack, 2015.
		External relationship networks	
	Leadership	Collective learning	Hage et al., 2008; Mishra, Chandrasekaran & Maccormack, 2015.
		Encouraging employee autonomy and integration	
		Guidance and support	
	Managerial practices	Group work	Liao & Greenfield, 1998; Verma & Sinha, 2002; Jordan et al., 2005; Park & Kim, 2006; Lee et al., 2011; Verma, Mishra & Sinha, 2011; Marafon et al., 2012; Chao & Kavadias, 2013; Saito et al., 2013; Valmorbida et al., 2014; Carvalho & Dos
		Strategic planning	
		Risk management	
		Knowledge management	

			Santos, 2015; Schreiber, 2015; Wang, Wang & Wu, 2015.
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Source: Developed by the authors (2020)

#### 4. METHODOLOGICAL ASPECTS

A case study (Yin, 2010) was carried out. The Federal University of Vale do Francisco Foundation (UNIVASF), a public law body created in 2002, was higher education, develop research in the various areas of knowledge and promote university extension. UNIVASF is inserted in the northeastern semi-arid region and has multicampi operations, including the states of Bahia, Pernambuco and Piauí.

This selection is due to UNIVASF's strategic position in the northeastern semi-arid region development and its commitment to scientific and technological progress, whose focus on research and innovation triggered the need for a political-institutional structure, strategically reshaping the Dean of Research, Postgraduate and Innovation (PRPPGI) in the three-dimensional promotion of these actions. In this study we opted for documentary analysis, non-participant observation and semi-structured interviews.

The research subjects are: PRPPGI managers, the Graduate Department and the Research Department, managers of the Budget and Management Dean, Department of Comparisons and Bidding of PROGEST Director and PROGEST Budget Director, besides three professors / researchers responsible for coordinating the processes of importing research equipment at UNIVASF, as follows.

The identification of the research subjects followed the confidentiality protocol necessary for the development of this research, as described in Figure 2, Coordinator (A), Coordinator (B) and Coordinator (C). Regarding the managers, the identification was through the order of the interviews, naming them in the following order: Manager (1), Manager (2), Manager (3), Manager (4) and Manager (5). It is noteworthy that one of the managers has already been coordinator responsible for the equipment import process and another interviewed Coordinator has held the position of manager at UNIVASF.

Table 2: Research subjects

Features	Research subjects	Identification
Coordinators of research projects that executed budget and successfully concluded the acquisition of imported goods and inputs in UNIVASF, due to the	Professor / Researcher responsible for the Coordination of the Vale Research Laboratory (LAPEVALE) - year 2007/2008.	Coord. A
	Professor/Researcher responsible for the coordination of the Post-Graduate Program in	Coord. B

complexity of the budget execution processes.	Materials Science - Project n. 131/07 - FINEP - year 2007/2008.	
	Professor/Researcher responsible for the coordination of the Postgraduate Program in Materials Science - Public Layer MCTI/FINEP/CT - INFRA - PROINFRA - 01/2001 - year 2013.	Coord. C
Managers of the Policies of Scientific, Technological and Innovation Research at UNIVASF.	Pro-Rector of Research, Graduate and Innovation of UNIVASF (PRPPGI-UNIVASF)	Manager 1
	Research Director of PRPPGI-UNIVASF	Manager 2
	Graduate Director of PRPPGI-UNIVASF	Manager 3
UNIVASF Budget Managers	Pro-Rector of Budget and Management of UNIVASF (PROGEST-UNIVASF)	Manager 4
	PROGEST-UNIVASF Purchasing and Procurement Director	Manager 5

The documents selected for this analysis were: Creation Law, UNIVASF Statute and Resolutions, internal edicts supporting and fostering the development of scientific and technological research. Reports issued by the Own Evaluation Committee (CPA) and the management reports of the institution were also analyzed. Thus, within the scope of the Institution, the Law that established UNIVASF and its Statute, six Resolutions, four Reports of the Evaluation Committee itself, three Management Reports, 15 Internal Calls for Research Support and Research, 20 minutes of meetings from Research Chambers and Graduate were analyzed. These analyzed documents are characterized in the tables listed below.

Table 3: Documents – Laws, Statutes and Resolutions of UNIVASF

Features	Document Type	Identification
UNIVASF Internal Standards	UNIVASF Law of creation	Law nr. 10,473 of 2002
	Statute of UNIVASF	2012 Statute
	Institutional Development Plan - last in force (IDP 2009-2014)	IPD (2009)
	Resolution on the creation of the Technological Innovation Nucleus.	Resolution n. 2/2001
	Resolution establishing standards for the Institutional Program of Scientific Initiation (PCI).	Resolution n. 4/2012
	Resolution that establishes General Norms of Postgraduate Activities of UNIVASF.	Resolution n. 9/2014
	Resolution establishing standards for registration of research projects and creation of research groups of the University.	Resolution n. 12/2013
	Resolution that establishes standards of operation of the Nucleus of Innovation and Technology (NIT).	Resolution n. 20/2014
	Resolution establishing standards for registration of research projects and creation of research groups.	Resolution n. 01/2015

UNIVASF has issued specific notices for the promotion and institutional development of postgraduate courses and scientific and technological research to stimulate innovation within UNIVASF, through its own financial contributions and jointly with these support agencies, according to notes in Table 4.

Table 4: Especific notices for the promotion scientific and technological research

Characteristic	Type of document	Identification
Internal notices supporting and encouraging the development of scientific and technological research at UNVIASF.	Announcement of financial support and execution of institutional projects of implantation, modernization and recovery of physical infrastructure of research in Public Institutions of Higher Education and/or Research.	Noticie CT-INFRA PROINFRA/FINEP 2012-1, 2013-1 e 2014-1
	Announcement of the Institutional Program of Scientific Initiation Grants (IPSI) for high school students and professionalizing.	Noticie PIBIC/CNPq High school 2012-1, 2012-2, 2013-1, 2013-2, 2014-1 e 2015-1
	Announcement of the Institutional Program of Scientific Initiation Scholarships (IPSI) aims to awaken the scientific vocation and encourage potential talents among undergraduate students.	Noticie PIBIC/FAPESB 2012-1, 2013-1, 2014-1, 2015
	Announcement of the Institutional Program for Scientific Initiation Grants (IPSI) for Affirmative Actions (AF).	Noticie PIBIC/AF/CNPq 2012-1, 2013-1,
	Announcement of the Initiation Program for Technological Development and Innovation (IPTDI).	Noticie PIBIT/CNPq 2012-1, 2013-1, 2014-1, 2015-1
	Edict to support the revision/translation of manuscripts for publication of articles in periodicals qualified for international circulation (A1, A2 and B1).	NoticiePUBLICA 2012-1 e 2015
	Edict to support the publication of articles in international journals with high impact.	Noticie Support Scientific Production 2015-1

A survey was carried out to evaluate the policies and actions of UNIVASF. The localized reports are described in Table 5, however, it should be noted that the 2011 and 2015 Management Reports were not available for consultation, as was the SEC 2015 Report.

Table 5: Reports of the self-evaluation Committee and report management

Characteristic	Type of document	Identification
Report of the Self Evaluation Committee (SEC)	Report of the SEC/UNIVASF 2011.	Report of the SEC (2011)
	Report of the SEC /UNIVASF 2012.	Report of the SEC (2012)
	Report of the SEC /UNIVASF 2013.	Report of the SEC (2013)
	Report of the SEC /UNIVASF 2014.	Report of the SEC (2014)
Report Management of UNIVASF	Report Management 2012.	Report Management (2013)
	Report Management 2013.	Report Management (2014)
	Report Management 2014.	Report Management (2015)

The time criterion was established for the search of the minutes and comprised the period from 2011 to 2015, with 20 minutes of ordinary meetings being located, as set out in Table 6.

Table 6: Minutes of the Research and Graduate Chamber meeting

Characteristic	Date of the meetings
Minutes of the Research and Graduate Chamber meeting of UNIVASF	(30/6/11)
	(14/02/12); (13/4/12); (24/9/12) e (19/10/12)

	(3/4/12); (10/7/13); (27/9/13); (29/10/13) e (9/12/13)
	(17/2/14); (20/3/14); (25/7/14); (29/9/14) e (12/12/14)
	(29/1/15); (23/3/15); (9/4/15) e (9/7/15)

The non-participant observation was made from deliberations at the research and postgraduate chamber meetings, when the first author attended two ordinary meetings of the UNIVASF Postgraduate and Research Chamber, respectively, on February 16, 2016 and February 17, 2016. In addition, another non-participant observation was made at the extraordinary meeting, whose agenda was to discuss the issues related to the CT-INFRA Institutional Notice, funded by FINEP, held on February 18, 2016.

Semi-structured interview scripts were subjected to testing and validation by a project management specialist to ensure the instrument's reliability and validation. The development of the empirical study was performed by the first author of this work, in all its phases. (Minayo, Assis & Souza, 2005; Yin, 2010).

Data collected through interviews and observations were transcribed and listed together with the documents. Data obtained from these sources of evidence were analyzed through content analysis, with the help of Nvivo software to quantify, according to the categorizing elements of organizational arrangements, leadership and university management practices in support of scientific, technological policy. and innovation (Creswell, 2010; Bardin, 2011). This research complies with Resolution Nr. 466 / 2012 of the National Health Council and was authorized by advice of the Ethics and Deontology Committee on Studies and Research Nr. 1,406,593.

## 5. RESULTS

The evidences identified from the analysis of the theoretical dimensions of organizational arrangements, leadership and university management practices in support of UNIVASF's Scientific, Technological and Innovation Research Policies indicate advances related to the facilitating aspects of university management dimensions (organizations arrangements, leadership and management practices) and limiters related to obstacles within the legal juridical and administrative systems, resources, lack of core support for project management as well as laboratory infrastructure.

### 5.1. Organizational arrangements

The dimension of the organizational arrangements presented as the most evident factor the actions of the institutional policy in the internal environment, highlighting the internal and interinstitutional calls for support and promotion of research at UNIVASF. In addition, the University's performance was identified with its own resources, even in place of funding from funding agencies. Relationship networks stand out in their support to agreements with national and international entities, university integration with the productive sectors for technology transfer, greater participation and participation of funding agencies and support for interdisciplinary activities with companies and other research organizations.



Figure 1: Evidence of organizational arrangements.  
 Source: Developed by the author based on Nvivo results.

The highlight of the emphasis on the facilitating aspect of institutional policy actions is the role of research groups and research teachers in developing relationship networks between national and international institutions. In addition, the discussions noted the need for building a Multidisciplinary Research Center and for integrated and collaborative use.

Thus, it is shown that there is evidence in the analysis unit (UNIVASF) of organizational arrangements. The organizational actions of institutional policy and relationship networks are emphasized and instrumentalized in norms, actions and testimonies from managers and researchers, reaffirming a strategic dimension for university management (Theis & Schreiber, 2014; Faccin & Balestrin, 2015; Maccormack & Mishra, 2015). The leadership guidelines are basically for meeting bureaucratic requirements and purchasing processes. Autonomy is related to the creation of a Multidisciplinary Research Center and group work, it refers to encouraging the development of projects with several research professors and companies from the productive sectors.

UNIVASF's encouragement to boost group work is perceived, both internally and externally. However, these actions are not significant yet. The group work actions are the initiative of teachers / researchers and the reference to Edital Casadonha Integra Campi was

highlighted as an institutional action. The guidelines and supports have a lower record of occurrence and with a strong PRPPGI performance. This practice was confirmed in the interviews.

### 5.2. Leadership

In leadership management, more measured statements and records are evident. The collective learning was not identified any reference, while the elements autonomy and integration, despite identifying only 13 evidences, obtained greater quantitative relevance, then group work with 12 and, finally, guidance and support 09 records. The collective learning was not mentioned, which raises questions, either for not considering being part of the leadership dimension, or for not observing it.

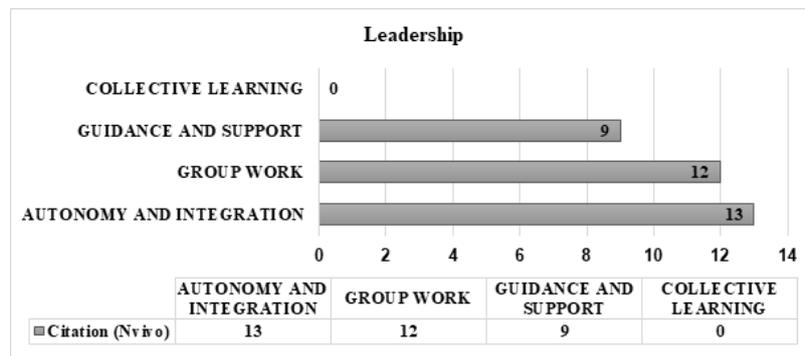


Figure 2: Evidence of leadership  
 Source: Developed by the author based on Nvivo results.

Leadership guidelines are primarily for meeting bureaucratic requirements and procurement processes. Autonomy is related to the creation of a Multidisciplinary Research Center and group work refers to the incentive to develop projects with several research professors and companies in the productive sectors.

UNIVASF's incentive to boost group work, both internally and externally, can be seen. But these actions are not yet expressive. The group work actions are the initiative of the teachers / researchers and the reference to the Edict Casadinha Integra Campi was highlighted as an institutional action. The guidelines and supports have a lower record of occurrence and strong performance of PRPPGI. This practice was confirmed in the interviews (Mishra, Chandrasekaran & Maccormack, 2015; Schreiber, 2015; Gritzo, Fusfeld & Carpenter, 2017).

### 5.3. Management Practices

From the analysis of the data some actions are identified that suggest evaluation, diagnosis and monitoring by indicators.

The main evidences are the PDI forecast of planning actions related to evaluation, development and control, prescribing the mission and institutional objectives, enhancing the development of information systems and evaluation of the finalistic activities and also conducts a Forum of Integration of the Teaching, Research and Extension as an instrument for evaluating the policy and possible results.

In knowledge management, the actions developed were the Publications in support of international publications and “Support for Scientific Production”, in addition to holding scientific exhibition events such as Scientex. Thus, the evidence points to the lack of resources, because through edicts that some actions were developed. During the interviews. actions to acquire systems were identified. The main actions are: expansion of scientific events, the creation of specific journals linked to the stricto sensu Postgraduate programs and online journal, implementation and maintenance of a digital library of theses and dissertations, research information system, registration of leaders and research groups, as well as, the improvement of internal and external dissemination of academic results.

It can be inferred from the risk management analysis as a management tool of unused assessment indicators as risk management measures. In the interviews there was little understanding about this management tool. Even so, there are some references in the analysis such as: evaluation and monitoring of institutional development through UNIVASF's Own Evaluation Committee, as well as the definition of indicators of human resources formation, scientific production, fundraising and patents, in addition to evaluation indicators from external bodies such as CAPES / MEC.

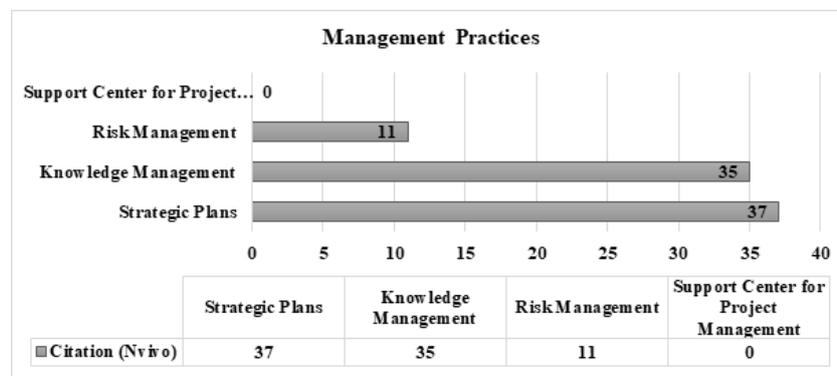


Figure 3: Evidence of management practices  
 Source: Developed by the author based on Nvivo results.

The results demonstrate management practices undertaken in order to support and aid scientific, technological and innovation policy at UNIVASF. Despite the evidence confirming

the lack of a support nucleus for project management and less reference to risk management, it is perceived in actions aimed at strategic plans and knowledge management more frequently, thereby reinforcing theoretically consistent management practices at the researched university (Verma & Sinha, 2002; Jordan et al., 2005; Park & Kim, 2006; Lee et al., 2011; Verma, Mishra & Sinha, 2011; Marafon et al., 2012; Chao & Kavadias, 2013; Saito et al., 2013; Valmorbida et al., 2014; Carvalho & Dos Santos, 2015; Schreiber, 2015; Wang, Wang & Wu, 2015; Kim & Chen, 2018).

In this sense, the main elements that contribute as facilitators of the university management to support Science, Technology and Innovation Policies are the relationship networks and the institutional policies of the organizational arrangements dimension. In relation to leadership, few references were identified, evidencing little or no attention to that dimension. In turn, in management practices of the elements that characterize knowledge management and strategic plans, there were between 35 and 37 references, however, there is shy attention from these facilitators of university management.

#### 5.4. Limiting Aspects

Table 7 deals with the categories and main problems evidenced in document analysis, non-participant observation and interviews that limit university management in support of UNIVASF's Science, Technology and Innovation Policy.

Table 7: Categorization of the main limitations in university management to the PCTI policy

Categories	Evidences
Obstacles in legal administrative and legal systems	Accountability, diverse regulations, difficulty in acquiring licenses from public agencies.
Lack of laboratory infrastructure	Lack of space in laboratories for new equipment, lack or problems in electrical, hydraulic, safety and storage facilities.
Lack of core support for project management	Confirmation of the need for a specialized sector to support the management of research projects, public contracting and rendering of accounts.
Financial resources	Exchange variation, taxes and difficulty in payments to suppliers, contingency and budgetary and financial constraint.

Barriers to legal administrative and legal systems, and the problems inherent in appeals, are the main limitations on scientific and technological research.

The lack of a project management support core at UNIVASF is the third most cited aspect, revealing the concern with this type of structure. From the synthesis of the theoretical framework of analysis, it can be observed that the managers and teachers / researchers of this IFES are unaware of the main project management tools, considered by the national and international literature as the best practices applied in management of research projects.

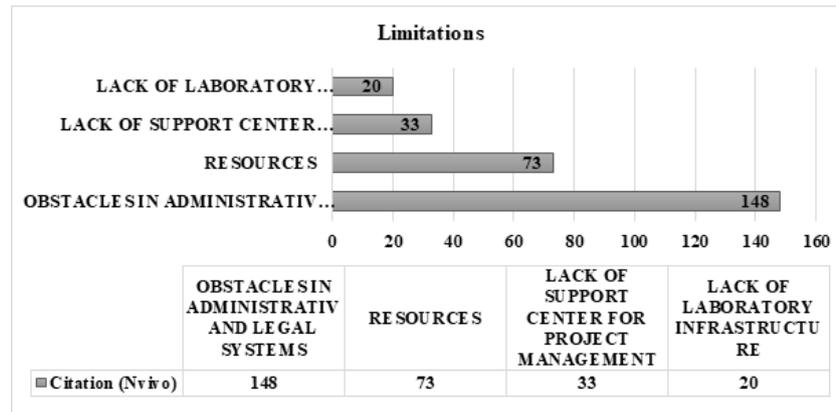


Figura 4. Evidence of limitations  
 Source: Developed by the author based on Nvivo results.

The main limits are the obstacles in the administrative and legal systems, resource-related problems that interfere with budget management, from insufficient to late delays. The analysis of this category exposes some weaknesses related to inefficiency in budget execution. There are references related to the edicts, but also, it is noticed there is little understanding of the researchers about this management tool.

## 6. CONCLUSION

From the literature review, we noticed an evolution in the development of research on the management of the Policy Supporting Scientific, Technological and Innovation Research at international level. Studies on the main theoretical dimensions of university management in support of Scientific, Technological Research and Innovation indicate as dimensions those referring to organizational arrangements, leadership and management practices and present as characterizing elements: institutional policy actions, relationship networks and collaboration, collective learning, mentoring and support, group work, autonomy and integration, core project management support, risk management, knowledge management and strategic plans.

University management actions may indicate facilitating elements in management practices to create an environment that is conducive to greater efficiency in organizations implementing the Public Policy for Scientific, Technological and Innovation Research in Brazil (Colon & Guérin-Schneider, 2015; Ashraf & Uddin, 2016).

The empirical study highlighted the aspects that facilitate and limit the development of university management of PCTI, analyzing how a federal university implemented in the 1990s, after the reform and modernization of the federal public administration, develops its management actions to give support for the PCTI policy at UNIVASF, which is responsible

for promoting teaching, research and extension in three states of the Northeast (Ba, Pe, Pi). This confirms the assumption that UNIVASF has university management characteristics that facilitate support for Scientific, Technological and Innovation Research Policies.

In light of the theoretical dimensions of organizational arrangements, leadership, and university management practices in support of PCTIs, it is clear from the case study that the main facilitators of university management actions are relationship and collaboration networks and institutional policy actions. Next, the facilitating elements in management practices are strategic plans and knowledge management. Risk management is incipient, and it cannot be said that it contributes as a facilitating element.

The categorization of the limiting elements of university management indicates as obstacles: administrative and legal systems related to difficulties in accountability, submission to various regulations, difficulty in acquiring licenses from government agencies. Financial resources occupy a prominent position, as follows: exchange rate variations, difficulties in payments to suppliers, contingency and budget constraint. Finally, the lack of infrastructure in laboratories is especially related to infrastructure and physical space issues.

The lack of a Research Project Management Support Center was highlighted as a limiting aspect. Thus, the development of actions that reduce the limiting aspects is recommended and the creation of a Project Management Support Center to reduce the obstacles to the implementation of the Scientific, Technological Innovation Development Research Policy at UNIVASF.

Because it is a unique case study, this paper presents all the limitations arising from its methodology, but for this same reason, it can contribute to other studies of this nature to expand knowledge in a strategic area to increase competitiveness. and for national development.

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[http://www.planalto.gov.br/ccivil\\_03/\\_ato2015-2018/2018/decreto/d9283.htm](http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2018/decreto/d9283.htm)

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