






Process-based management effectiveness in a public Higher Education Institution: quantitative insights from a pilot project

Eficácia da gestão baseada em processos em uma IES pública: percepções quantitativas de um projeto-piloto

Eficacia de la gestión basada en procesos en una IES pública: percepciones cuantitativas de un proyecto piloto

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Abstract

The purpose of this paper is to identify the factors that influence on process-based management effectiveness. A survey was carried out in a Brazilian public Higher Education Institution (HEI) and a valid sample of 202 responses was obtained. Data analysis was performed through multivariate statistical techniques, which included both exploratory factor and regression analyses. The results showed that understanding and commitment, user value, process standardization, continuous improvement and non value activities identification influence the effectiveness of processes. A regression analysis was adopted to identify the dimensions of HEI process effectiveness. As practical contributions, this study helps to the development of strategies and actions that enhanced a more effective university management scheme by the better understanding of Process-based Management Practices on the process effectiveness. Those results may also have a direct contribution on the academic community which will be benefited with the development of better process-based management decision-making practices in terms of higher levels of efficacy, efficiency and relevancy of the internal processes execution. Finally, in terms of originality and value, this paper implies on a better identification of the attributes that will aggregate the process-based management patterns, prioritizing the strategies and actions that will contribute to excellence in decision-making.

Keywords: process-based management. process effectiveness. public service. higher education institutions. lean management.

Resumo

O objetivo deste artigo é identificar os fatores que influenciam na eficácia da gestão baseada em processos. Foi realizada uma pesquisa em uma instituição de ensino superior (IES) pública brasileira, com resultado de uma amostra válida composta por 202 respostas. A análise dos dados foi realizada por meio de técnicas estatísticas multivariadas compostas de análises exploratórias de fatores e de regressão. Os resultados mostraram que a compreensão e o comprometimento, o valor para o usuário, a padronização do processo, a melhoria contínua e a identificação de atividades sem valor influenciam a eficácia dos processos, além de ter sido adotada uma análise de regressão para identificar as dimensões da eficácia do processo das IES. Como contribuições práticas, este estudo contribui para o desenvolvimento de estratégias e ações, potencializando um esquema de gestão universitária mais

eficaz através da melhor compreensão das práticas de gestão por processos. Esses resultados também podem ter uma contribuição direta para a comunidade acadêmica, que será beneficiada com o desenvolvimento de melhores práticas de tomada de decisões gerenciais baseadas em processos, com elevados níveis de eficácia, eficiência e relevância da execução dos processos internos. Por fim, em termos de originalidade e valor, este artigo implica em uma melhor identificação dos atributos que agregarão os padrões de gestão baseados em processos, priorizando as estratégias e ações que contribuirão para a excelência na tomada de decisões.

Palavras-chave: *gestão baseada em processos, eficácia do processo, serviço público, instituições de ensino superior, gestão enxuta*

Resumen

El objetivo de este artículo es identificar los factores que influyen en la eficacia de la gestión basada en procesos. Fue realizada una investigación en una institución de enseñanza superior (IES) pública brasileña y se obtuvo una muestra válida de 202 respuestas. El análisis de los datos fue realizado por medio de técnicas estadísticas multivariadas, que incluyeron análisis exploratorios de factores y de regresión. Los resultados mostraron que la comprensión y el comprometimiento, el valor para el usuario, la estandarización del proceso, el mejoramiento continuo y la identificación de actividades sin valor influyen en la eficacia de los procesos. Fue adoptado un análisis de regresión para identificar las dimensiones de la eficacia del proceso de las IES. Como contribuciones prácticas, este estudio ayuda en el desarrollo de estrategias y acciones que potencian un esquema de gestión universitaria más eficiente por medio de una mejor comprensión de las Prácticas de Gestión Basadas en Procesos en la eficiencia de los procesos. Estos resultados también pueden tener una contribución directa para la comunidad académica, que será beneficiada con el desarrollo de mejores prácticas de toma de decisiones gerenciales basadas en procesos en términos de niveles más altos de eficacia, eficiencia y relevancia de la ejecución de los procesos internos. Por fin, en términos de originalidad y valor, este artículo implica en una mejor identificación de los atributos que aportará los estándares de gestión basados en procesos, priorizando las estrategias y acciones que contribuirán para la excelencia en la toma de decisiones.

Palabras clave: *gestión basada en procesos, eficacia del proceso, servicio público, institución de enseñanza superior, gestión optimizada.*

The interest in adopting new management practices such as process-based management is growing among the service and education organisations. Unfortunately, the research results in this area and from these organisations are still incipient, especially in the public sphere. In Brazil, the Higher Education Institutions (HEIs), from various sizes and structures, must compete aggressively to fill their recurring vacancies (Petrusch et al., 2019). Thus, the adoption of new management strategies and systems will allow the rationalization and the optimization of the existing processes to reduce the HEI's operating costs, to streamline its current procedure to increase its effectiveness (Silva et al., 2012). This project describes the tendency of the Brazilian HEIs in conducting process-based management activities instead of using the traditional functional approach. But such form of management is still at a starting point, and will grow steadily, due to the inefficiency from the excess of bureaucracy and laws.

In other sectors of the Brazilian public service, like in healthcare, process-based management projects have been implemented to achieve greater efficiency and positive results (Ferreira et al., 2018; Rentes et al., 2019). Such projects included organizational process revisions and waste reductions from the premise that waste elimination and process management also reduce management time and costs, making process management an essential part of the leading contemporary organisations. Efficiency in public management has been the subject of several Brazilian studies since it became one of the key public management principles, formalized by the 1998 amendment of the Brazilian constitution. Such efficiency made possible the insertion of new management proposals with a focus on innovation and the improvement of public management processes. Both the efficiency and the effectiveness have been incorporated in the Brazilian public service as key components, since it started to focus on promptness and functional performance (Sentanin et al., 2008). The process and resource optimization strategies started to become a requirement in the Brazilian public organisations at large, based on an increasing concern for at large satisfaction from the public (Rentes et al., 2019).

On a planetary scale, many organisations have expressed concerns about the barriers and the difficulties in implementing and maintaining a process-based management approach (Palmberg, 2010). For some of them, research on process-oriented public organisations is still incipient (Christiansson & Rentzhog, 2019). But there are certain peculiarities and rules that need to be incorporated in public management to achieve process effectiveness (PE) and the execution of such activities generates a greater degree of complexity. In most Higher Education Institutions (HEIs), endogenous organizational schemes involve time-consuming systems and processes that are not as efficient as they should be (Petrusch et al., 2019; Pinheiro et al., 2021). Some processes may perform functions that generate transparency, but it still involves procedures that do not add service and end user values, where the concept of value, from the customer's point of view, becomes essential for an efficient process management (Hernaus et al., 2016).

The author's view becomes more obvious in HEIs, because the client is in fact the citizen, the student (Douglas et al., 2015). Furthermore, organizational efficiency improvement is not an easy task that can be quickly resolved by only deploying process-based management procedures since there is a high complexity that is imbricated in this achievement. All these factors end up affecting the results and the effectiveness of process management.

The concept of PE refers to a measure that considers the result from the number of tasks performed, compared to those initially planned in a specific period of time (Seyyedamiri & Tajrobehkar, 2019), considering the process value obtained from the "end user" (Burlton, 2015). It is the outcome of the relationships between the organizational processes, tasks, activities, results and its management as a whole, without considering the roles of its managers, teams, and employees, as well as the user's perspective.

In fact, there is a need to verify how those elements influence the results of process management and its effectiveness. Some studies have been carried out on key critical success factors (CSFs) on the implementation of Business Process Management - BPM (Castro et al., 2020; Trkman, 2010; Vom Brocke et al., 2014). However, few studies have been done from a process outputs perspective and their actual results on effectiveness are still limited, especially in the public sphere (Ferrari et al., 2018). The critical success factors, although highly valuable and discussed in the literature, are "partially formulated as actionable recommendations" (Malinova & Mendling, 2018, p. 882) to improve management processes, but a better understanding of its influence on process effectiveness is still lacking.

In a BPM application, it is essential to validate if the process management measures consider results such as Process Effectiveness to verify if decisional outcomes do respond to the initial expectations (Malinova & Mendling, 2018). Different studies from the literature on Business Process use performance measures (Ruessmann et al., 2020), but they refer to various organizational perspectives such as the economy or finance, which may not be necessarily linked to Process Management factors. Thus, the question that remains unanswered is about the impact of CSFs on Process Effectiveness. This article investigates this theoretical gap and intends to bring a theoretical contribution on the subject. Based on that, the objective of this paper is to identify the factors that have an influence on process-based management effectiveness.

The main contribution of this research is to provide a quantitative approach to measure the influence of CSFs on PE. This approach deals with the operational, behavioral and organizational elements of a previous validated study that uses and measures of adoption of "lean services" (Malmbrandt & Åhlström, 2013). The benefits are twofold: 1) in addition to fitting in for the analysis of service providers and the purposes of this research, 2) there is a close approximation between the process management approach and the lean management philosophy (Maldonado et al., 2020). Furthermore, the studies will assist the UFSM in upgrading its "value chain", by outlining the main processes that add value to the academic community and to promote interaction between the different organizational units. Finally, this work also contributes to enrich the spectrum of real-world cases on practical experiences of process management projects (Vom Brocke & Mendling, 2017).

Process-Based Management

The concept of process-based management can be interpreted as a disciplinary approach to identify, design, execute, document, measure, monitor, control and improve processes, automated or otherwise, to achieve consistent results and to promote alignment through organizational strategic objectives. It supports organizational development and innovation (Gomes et al., 2022; Tang et al., 2013), cost reduction and rapid change response (Weske et al., 2004). Process-based management can become an agile way of organizing operations and activities that transcends the traditional functional structures (Badakhshan et al., 2019). Its activities shape up efficiency, quality, and agility until they are incorporated within an organizational structure (Angelis et al., 2021; Hernaus et al., 2016). Also, process-based management strategies allow the public and non-public organisations to adapt quickly to change (Neubauer, 2009) and to achieve a quality collective learning pattern (Bawden & Zuber-Skerritt, 2002), more specifically in the public and service sectors organisations (Ferrari et al., 2018; Gullede & Sommer, 2002; Sentanin et al., 2008).

According to the literature, to be able to implement process management in any organisation, some barriers must be overcome, and the main difficulties usually come from natural reluctance to change and from organizational culture. Specially in HEIs, the existent culture was built up on a traditional way that overcomes decades of existence, making it hard to achieve change patterns (Balzer et al., 2015).

The concept of organisational culture defines a path from which the actors of an organisation relate to each other, their work, and the outside world in comparison to other organisations, which may enable or hinder an organisation's strategy (Hofstede et al., 2005). The authors define organizational culture as a set of values, expressed by symbolic elements and organizational practices, which may assign meanings and build organizational identity. Thus, an organisation's culture is a system of shared values and beliefs that influence the behaviour of those who share them. A cultural change generates the capacity of an organisation to endogenously create a base for improvements, through its employees' involvement and commitment (Pavlovic et al., 2014).

The BPM implementation requires a long-term thinking and the diffusion of a process-based culture. In the absence of such, organizational performance may even worsen compared to a more traditional pattern (Majchrzak & Wang, 1996). Based on the literature, Table 1 introduces the critical factors for a process-based management

(Ariyachandra & Frolick, 2008; Klun & Trkman, 2018; Trkman, 2010). This table demonstrates the main critical success factors described by articles on this subject. These works are theoretical studies and empirical applications in the public or private sector that made use of BPM to improve organizational processes.

Table 1

Critical Success Factors in Process-based Management.

Critical success factors	Authors
High management support	Trkman (2010); Bandara <i>et al.</i> (2005)
Integrated process performance measures or indicators	
Satisfactory quality, improvement and reward system	
Well established team culture and Organizational management for change	Trkman (2010)
Process standardization, informatization and automation	
Process Owners	Trkman (2010); Danilova (2019)
IT investment, integration and support	Trkman (2010); Adamides (2015)
Employee's specialization and empowerment - PM guidance, training and communication	Trkman (2010); Lederer <i>et al.</i> (2017)
Defined methodology and integrated business process architecture and project management	Manfreda <i>et al.</i> (2014); Bandara <i>et al.</i> (2005)
Commitment toward leadership	Gębczyńska (2016); Hernaus <i>et al.</i> , (2016)
Alignment between strategy and BPM	Rentes <i>et al.</i> (2019); Trkman (2010)

These critical success factors have been addressed in research related to this study and in the dissemination of projects that use the BPM methodology for service-oriented processes, BPR (Business Process Re-engineering), and TQM (Total Quality Management). Moreover, business processes must be managed in a continuous cycle in observation to these critical success factors to maintain integrity and enable transformation. According to BPM CBOK, (2019), business strategy implies a permanent and ongoing commitment throughout the organisation to ensure that all the processes are in a path that converge with the organizational strategy and the customer needs.

A process-based management pattern also requires commitment of the group of employees to achieve agreed outcomes (Bawden & Zuber-Skerritt, 2002), delegation and leadership of the work team (Ongaro, 2004) and managerial support bases (Radnor, 2010). Many organisations devote extensive resources on Process Management to obtain a series of concrete and observable sequence of events, and presenting their processes in several levels, but without a plausible and practicable connection between them, that may not lead to the expected planned effects (Palmberg, 2010). Some paradigms still resist to new management standards, especially where knowledge concentration and retention are the most important concerns for the organisations today. The idea is the more knowledge an organisation retains, the more power it holds.

3 Process-Based Management Effectiveness

Process-based management approaches are being carried out in numerous organisations to upgrade their organisational effectiveness and have been avoiding the organisation's traditional functional and operational roots (Haynes, 2018; Isik *et al.*, 2013). Effectiveness can be understood as the ability to improve organizational strengths, based on the way that activities are disposed. It may include the notion of "doing the right things right". Taking this concept into administration, effectiveness can be understood as the number of planned tasks that were done in a period and which results were in accordance to those expected (Andrews *et al.*, 2019; Longo & Rotolo, 2016; Santos *et al.*, 2021; Seyyedamiri & Tajrobehkar, 2019).

In the Brazilian public administration, the concept of effectiveness means to ascertain and to identify the opportunities that are most in line with the population's needs. This makes effectiveness the most applicable concept, given that nothing is more inappropriate for public administration than to effectively do what simply does not need to be done (Torres, 2004). The public sector is increasingly demonstrating the need to improve its activities and evolve as any organisation improves its work processes to achieve its objectives with maximum effectiveness.

Effectiveness can be understood as the social value of the product or the quality of the result, the degree to which the expected result has been achieved in relation to the intended objectives (Seyyedamiri & Tajrobehkar, 2019). Therefore, it is not just an economic concept, such as efficiency, but a qualitative evaluation of public services, with the understanding that the government should, above all, provide good services to its population.

The effectiveness of a specific process can be considered as the outcome of a process management measurement procedure. The more effective and consistent processes are when better are the outputs and lower are the costs. Lawrence and Lorsch (1967) see that organizational effectiveness is related to the degree of alignment between the structures, their processes, and environments. Other authors argue that an effective process has close relations with quality performance (Zeng et al., 2013), innovation (Jones & Linderman, 2014), lower costs (Lockamy & McCormack, 2004) waste reduction (Schaefermeyer et al., 2012), and the users' motivation (Isik et al., 2013).

Such close relationship between process management and effectiveness must be implemented and assessed in public services like the Brazilian HEIs. The implementation of a process-based management in an organisation implies the understanding that business management under the process management approach does not simply result in a finished product. There is a need of permanent and continuous improvement phases (Pritchard & Armistead, 1999). The replacement of the old management model by a process-based management pattern does not end with the implementation of the project itself. To adapt to changes, there is a cyclical chain that must be constantly fed back and refined through the reconfiguration of resources, lived experiences, indicators and results controls (Sincorá et al., 2018).

Method

Unit of analysis

The Federal University of Santa Maria, Brazil (UFSM), which was created and implemented in 1960 in the Santa Maria region, which is situated at the core of the State of Rio Grande do Sul, was the first HEI to be established outside the capital of a state of Brazil. Its primary activities led to the creation of research groups in the areas of pharmacy, medicine and dentistry, jointly with the creation of an electrotechnical course at the new polytechnic center. Over the years, the number of courses instituted at the UFSM increased significantly, including the creation of various distance learning patterns. In addition, UFSM expanded its teaching units by opening campuses in the cities of Cachoeira do Sul, Palmeira das Missões and Frederico Westphalen, one being situated more than 300 kilometers from the main campus. It represents the most important HEI in terms of geographical territory and students' attendance in the western part of the State of Rio Grande do Sul.

The study was developed at the the UFSM that design and implement an administrative reform project in 2016, which sought to map and optimize the organizational processes at the upper management levels and through its sub-units. This project contemplated the alignment among Process Management, Competence Management, Archival Management and Risk Management. It generated a positive impact on the whole UFSM, as it sought to develop continuous improvement in its work processes, increasing the quality of the services provided (UFSM, 2018).

The main objective of this reform was to improve the HEI's processes with a focus on the students' needs, to reduce procedural bureaucracy and waste, and to encourage the employees' involvement to enhance, simplify and standardize its processes and to provide the HEI with an efficient organisational scheme that ensures performance and effectiveness. Such initiative is planned to be expanded to other UFSM administrative units and regional campuses.

Data collection

A survey was conducted with the application of a structured questionnaire (Malhotra et al., 2012), based on a 10-points Likert scale, ranging from 1 (low agreement with sentence content) to 10 (high agreement with sentence content). Following the recommendations of Forza (2002), the content of the questionnaire was validated by applying this instrument to two professors and two managers directly involved in the implementation of the process-based management at the university. The respondents made specific observations about the questionnaire, which was amended for a better understanding. Such procedure was adopted to avoid misinterpretation. All questions were revised and written as clearly and unambiguously as possible, by using a common vocabulary (Groves et al., 2011).

The instrument variables were designed from the process management success factors, based on Malmbrandt and Åhlström (2013), Trkman (2010) and Isik et al. (2013), as demonstrated on Table 2.

Table 2*Structure of the questionnaire.*

Dimension	Number of questions	Reference
Servant's commitment	4	
Servant's training	5	
Servant's understanding	5	
Management's commitment	5	
Management's understanding	5	
Time to work improvement	4	Malmbrandt and Åhlström (2013);
Resources to work improvement	4	Trkman (2010)
Customer value	6	
Flow information	6	
Waste identification	6	
Process standardization	5	
Continuous improvement	4	
Process effectiveness	10	Isik et al. (2013)

The research instrument was composed of a first section related to the dimensions demonstrated in Table 2. In a second part, the research instrument was composed of questions about the respondents' profile, more specifically about gender, length of employment, education, and whether they hold a management position in their sector.

The population for this study relied on the guidelines of the UFSM pilot project which included the public servants from the Chancellor's office and its support units of UFSM. Data collection was conducted online between March 2020 and June 2020, with the support of the university's data processing center, which drafted an online version of the questionnaire. Respondents were contacted via email to receive an explanation of the study and to invite them to complete the questionnaire. A sample of 202 valid respondents came out, representing 17,52% of the population. Data was automatically made available on a spreadsheet. Responses were then transferred to a Windows Excel 2010 spreadsheet for a later analysis in the Statistical Package for Social Sciences (SPSS) version 20.1.

Data analyses

The data analysis procedures initially performed a sample descriptive analysis and was subsequently explored through an exploratory factor analysis. It allowed the existing structure of interrelations (correlations) analysis the between many variables, making it possible to define sets of factors that are strongly interrelated (Hair et al., 2010) and application of an exploratory factorial with the Bartlett's sphericity test and the Kaiser-Meyer-Olkin index (KMO) were verified. The number of factors were specified with the Eigenvalue calculation, a Varimax rotation was done, and the internal consistency of the stipulated factors was verified by a Cronbach's Alpha calculation. Also, the variables that were reducing the consistency factor value were removed to obtain the minimum required value of 0.7 (Hair et al., 2010). Finally, a multiple regression was performed to study the dependence of one variable on more explanatory or independent variables (Gujarati & Porter, 2009).

According to Malhotra et al. (2012), a regression analysis is an effective and flexible process for verifying associative relationships between a dependent metric variable and one or more independent variables. In the present study, this tool was used to verify the influence of the Critical Success Factors on the efficiency of Process-based Management Implementation. To verify the model's assumptions, a series of tests were realized, including: 1) the Durbin Watson test, to measure the presence of serial correlation (Gujarati & Porter, 2009); 2) the tolerance measurement – TOL with results greater than 0.10, and the condition index - VIF tests, which must be less than 10, to verify the premise of factor multicollinearity (Hair et al., 2010); 3) the Kolmogorov-Smirnov - KS test, to verify the normality of residues under the null hypothesis and to validate that the distribution of the tested series is normal; and (4) the Pesaran-Pesaran test, to verify the residual homoscedasticity on whether the residual variance remains constant across the spectrum of the independent variables used in the model (Gujarati & Porter, 2009).

Results Analyses

The results analyses include the aspects related to the researched sample, the factors analysis and their impact on the processes' effectiveness at the Federal University of Santa Maria (UFSM), Brazil.

Sample descriptive analysis

The sample consisted of 202 university public servants, directly involved with the implementation of the university process-based management project. Table 3 presents the sample characterization.

Table 3

Respondents profile and general context

Variables	Alternative	Percentage
Gender	Male	47,60%
	Female	52,40%
Period of service at university	Up to 1 year	4,80%
	Up to 3 year	13,80%
	Up to 5 year	14,50%
	Up to 10 year	29%
	Over 10 years	37,90%
	High school	4,80%
Education Level	University – 1st cycle	17,20%
	University – 2nd cycle – no research	31,7%
	University – 2nd cycle - MSc	32,40%
	University – 3rd cycle - PhD	13,80%
Head of Unit	Yes	29,70%
	No	70,30%
The standardization of processes and tasks occurs because of the:	Sector's interest	55,9%
	Management policy	44,1%
Unit processes are publicized and clarified in the industry	Yes	62,8%
	No	37,2%
Information flow occurs with a user-accessible language	Yes	69%
	No	31%

Data from Descriptive Statistics Results

The sample profile analysis, as presented in Table 3, shows that the number of respondents is balanced between men (47.6%) and women (52.4%), and most respondents have more than 6 years (66.9%) of service at the University. It shows an added value pattern for the implementation of the process-based management project, since they already have good knowledge of the legislation and the historical context of the organisation's policies. Another factor that contributes to the project's success refers to the level of education that can be considered as high. With 79 % of the respondents having a master's degree (32.4% research and 31.7% non research) or PhD (13.8%), the sample is highly adequate for any new practices understanding and thoughtfulness. Also, another noteworthy detail from the respondent sample profile that is note worthy refers to the low level of participation from leadership positions. In fact, more than 70 % of the respondents do not occupy leadership positions, showing a great interest from the servants to operationalize the process standardization and the service improvement.

The general context analysis shows that the main reasons for process and task standardization come from each sector's own interests (55.9%), focusing on "management policy" as the most important aspect. But when it comes to the concepts of disclosure and information's flow, both answers are positively perceived. Most of the respondents (62.8%) understand that most of the processes are disclosed and clarified within the unit itself (69%) and that the information flow occurs in a user-accessible pattern.

Factor analysis

The Bartlett and KMO tests were used to identify the quality of the correlation's matrix between the variables and to verify the applicability of the factor analysis (Hair et al., 2010). The obtained KMO value of 0.861 and the Bartlett's sphericity test (Approx. Chi-Square = 6484.317) indicated data factorability of all the questions used in this research.

The commonality presented in each question of the research instrument was identified after verifying the adequacy of the factor analysis. The variables that had values of less than 0,5 were removed from the instrument (Hair

et al., 2010). The Varimax rotation method was used to facilitate the interpretation of the variables and to minimize the number of questions with a high factor load (Malhotra et al., 2012), which resulted in 12 factors to account for 73.41% of all data variance. One of them was composed by only one variable and was excluded from the analysis, as presented in Table 4. Furthermore, a Cronbach's Alpha was calculated and two factors were composed by two variables that obtained values below 0.7 (Hair et al., 2010). They were also removed from the analyses.

Table 4*Factorial Analysis Results.*

Description	Fatorial load
FACTOR 1 – Management Understanding and Commitment - Cronbach's Alpha (0,928)	
The managers of my sector think of process management as improving the flow of tasks, among other things	,822
The managers of my sector focus on internal efficiency when they talk about management by processes	,817
The managers of my sector ask questions about problems and suggestions for improvement and believe in management by processes	,817
Managers in my sector are able to explain process management when they think of daily activities	,798
Managers in my sector are able to describe what the ideal flow of tasks would be and how to work to achieve that flow	,791
The managers of my sector ask questions in an instructive way to lead to innovative solutions in my sector	,771
Managers in my sector show support for process management and approve time and resources for work improvements	,693
Meetings or courses are held to improve the work	,606
FACTOR 2 – Information Flow - Cronbach's Alpha (0,922)	
The routing of information between the public servants and different levels of management is working well in all areas of the organisation	,844
The forwarding of daily information on improvement actions to the different levels of management is efficient	,807
Likewise, information is continually returned to improvement sites when coming from different levels of management	,776
The forwarding of information between servers and different levels of management is done in a standardized way in most areas of the organisation	,684
Process maps are continuously updated and used for activities	,612
Process maps are viewed at the workplace and updated more than once a year	,597
FACTOR 3 – Public Servant Incentives - Cronbach's Alpha (0,817)	
No time is spent in my sector for improving work	,698
There are no investments or resources allocated for improving the work	,610
Infrequently, some time is devoted to improving work in my sector	,598
There is no real effort to understand the value of the process to the user	,581
The servers in my sector have no way of taking information to different levels of management, and they rarely obtain information from higher levels of management	,571
The managers of my sector do not take an active role in the adoption of management by processes and see this mainly as something for other employees to do	,557
FACTOR 4 – Understanding and commitment - Cronbach's Alpha (0,848)	
I see improvement work and process management as an important part of daily work	,782
I think of process management as improving the flow of tasks, among other things	,778
I actively participate in the improvement work in my sector, see problems, present suggestions for improvement and believe in long-term process management	,775
I express support for process management and dedicate time and energy to propose ideas for improvement	,737
Me and the other servers in my sector were able to describe what would be the ideal flow of tasks and how to work to achieve that flow	,571
I focus on the internal efficiency of my sector when I talk about process management	,566

FACTOR 5 – Process Standardization - Cronbach's Alpha (0,884)	
In our work, we begin to monitor whether the agreed standards are being used	,753
Standard processes are continually updated and we are challenged to do so	,703
When there are deviations in quality, time, etc., in the development of activities, there is, in our sector, a standard that is used as a guide	,644
The use of standardized tasks or processes in some areas is starting to become more explicit, detailed and written	,601
FACTOR 6 – User Value - Cronbach's Alpha (0,850)	
Seeking to add value to the service user in activities is something that is constantly challenged in my sector	,695
I can see and describe which activities add value or not to the user in my own work	,632
All servers can see which part of their activities increases the user's value and which does not	,588
Most areas of the institution are actively discussing the value of the service user and what activities contribute to it or not	,526
Investments or resources are made to increase the value for the user	,486
Users are often asked to provide feedback, which is used for process improvement work in my industry	,411
FACTOR 7 – Public servant Training - Cronbach's Alpha (0,813)	
The public servants regularly participate in some training in process management, but the application to improve the processes varies between them	,814
I continually receive training in different aspects of improvement work, and I am considered competent and able in this improvement work	,802
Public servants regularly participate in training in improvement techniques and the ideas underlying management	,673
FACTOR 8 – Continuous Improvement - Cronbach's Alpha (0,766)	
When there are meetings or informal meetings in my sector to discuss a certain process, most employees do not participate	,750
All the public servants in my sector actively participate in the work of continuous improvement in relation to the processes of which they are part	,719
All the employees in my sector participate in the work of continuous improvement, but the level of involvement and dedication varies	,590
In my sector, it is not possible to verify the participation of public servants in the continuous improvement of work	,487
FACTOR 9 – Non Value Activities Identification - Cronbach's Alpha (0,780)	
Activities with no added value are identified based on recurring internal problems	,679
Activities with no added value are identified based on the service user's perspective	,649
FACTOR 10 –Process effectiveness – Cronbach's Alpha (0,947)	
In general, the processes are well done	
The processes provide good quality results	
The processes meet the users' expectations	
Process performance is consistent	
Process performance is reliable	
The processes generate great added value results	
Process management is low cost	
The processes help to eliminate waste	
Processes help motivate employees	
In general, the processes are effective	

Data shows that the exploratory factor analysis resulted in nine valid factors that meet the criteria established for this research. The "Management Understanding and Commitment" factor (F1) deals specifically with assertions about how much the senior management and the sector directors are engaged and committed to the process management activities and how much they understand them, since skills and involvement from the senior management are required to implement the management strategies (Gębczyńska, 2016).

The “Information Flow” factor (F2) involved process mapping, which included six sentences about how the information is communicated and transmitted between the public servants at different levels of the organisation. The same pattern applies to both the “Public Servant Incentives for BP” (F3) and the “Understanding and commitment of civil servants” (F4) factors. The application of a management strategy depends on the participation, the involvement and the commitment of the people responsible for carrying out the organizational strategy, since the importance for the employees to adhere to such activities to efficiently implement process management programs (Hernaus et al., 2016; Malinova & Mendling, 2018). The “Training and Empowerment of Servers” factor measures the extent to which employees receive training and qualifications so that their performance is aligned with the implementation of process management, giving them more autonomy and freedom to perform their work (Hussain et al., 2017).

The “Process Standardization” factor (F5) essentially gathers information about the use of standard activities, tasks and processes in the daily work routine of the civil servants in the university sectors. This factor is critical for the implementation of process management (Trkman, 2010). The “User Value” factor (F6) refers to questions about how activities are targeted at the user’s level and the nature of its involvement in the process. This includes user’s needs, actions and feedbacks, interactions between the users and the public servants, their resources and their activities that generate user’s value.

Factor F7 refers to training activities, and to the autonomy and the responsibility given to public servants to accomplish their specific tasks, which generates their empowerment. Trkman (2010) mentions the importance of training in process management and highlights the fact that managers need to trust their collaborators to delegate some autonomy and responsibility for the achievement of their goals. To some extent, training activities increase employees’ involvement and foster a true “sense of ownership” (Vom Brocke et al., 2014), which translates into empowerment.

The eighth factor (F8) regroups the attributes related to continuous improvements that make possible process quality improvement (Ferrari et al. 2018), to rationalize it, to meet organisational and market requirements and to generate a continuous improvement culture (Almeida et al., 2017).

The “Value Identification” - factor (F9) - is very close related to continuous improvement and seeks to verify how activities with no added value are identified and how errors are visualized. Such activity is pursued by reducing or eliminating tasks that do not add value to improve the organizational processes. Such pattern is purpose led and it exerts in organizational change and value creation and value (Vom Brocke et al., 2014).

Finally, in relation to Process Effectiveness measures, the Cronbach’s Alpha calculation verified the internal consistency of factor (F10), as also presented in Table 4.

Process Effectiveness Analysis

A multiple linear regression analysis was performed to investigate the process-based management effectiveness. The regression model was elaborated using the stepwise method, having as dependent variable the Process Effectiveness measure and as independent variables the factors studied and explained in the previous section of this article. Table 5 shows the coefficient, constant, and evaluative values of the resulting model.

Table 5

Multiple Regression Model

FACTORS	Standardized Coefficients	t	Sig.	Collinearity Statistics		R Square (R ²)	Teste Anova	
	Beta			Tolerance	VIF		Value	Sig.
Understanding and commitment (F4)	0,329	6,058	0,000	0,713	1,185	0,579	25,976	0,000
User Value (F6)	0,228	3,208	0,002	0,612	1,635			
Process Standardization (F5)	0,227	2,906	0,004	0,671	1,489			
Continuous Improvement (F8)	0,156	2,318	0,022	0,466	2,146			
Non Value Activities Identification (F9)	0,117	2,048	0,042	0,786	1,272			
Dummy variable - Head of sector	0,107	2,131	0,034	0,829	1,206			

Note: Dependent Variable – PE

The Anova Test was significant for the resulting model from the Multiple Regressions, indicating that at least one of the independent variables influences the dependent variable. This fact is corroborated by the t-test analysis since some model variables presented significant values at 5% (sig less than 0.05).

The adjusted multiple determination coefficient (R²) was used as an indicator in order to measure the fit quality of the formed regressions model. This coefficient represents the dependent variable variance proportion measured around its mean that is explained by the independent variables. It is a regression line fit measure (Hair et al., 2010).

The last regression model shows that 57.9% of the Process Effectiveness can be explained by the following factors: the understanding and the commitment of the UFSM public servants, the user value, the process standardization scheme, the continuous improvement activities, and the value identification. Furthermore, the control variable “head of sector” also helps to explain the dependent variable.

It should also be noted that the average obtained for Process Effectiveness, on a 10-point scale, was 6.53 from the respondents’ perception. Therefore, investigating and analyzing other factors that are not explained in the regression model may increase the average perception of process effectiveness.

Based on the model verification measures used in this research, it can be verified that the ultimate model meets the evaluated assumptions:

- Firstly, it is noteworthy that the model meets the adequacy criteria regarding the multicollinearity issue, because the Tolerance and VIF index measurements present satisfactory values according to the parameters presented in the method of this paper.
- Secondly, the model meets the normality assumptions, as the K-S test did not present a significant value of 5% (sig = 1,000). In this case, the null hypothesis of normality of the residues is accepted.
- Thirdly, the model also presents no problem regarding the issue of residues self-correlation, since the Durbin Watson test presented a value of 2,126, by meeting the criteria of Gujarati and Porter (2009). These authors stipulate that, in order to meet the assumption that there is no self-correlation, the Durbin Watson Test result must have values ranging from 1.52 to 2.48 for a sample of 100 to 150 cases (considering 1% significance).
- Fourthly, the Pesaran-Pesaran test results presented a non-significant value at 5% (sig = 0,869), which leads to the acceptance of the null hypothesis that the residues are homoscedastic.

Discussion

The equation of the regression model shows that the “Understanding and commitment of the public servants” factor has the greatest weight in explaining Process Effectiveness. It becomes vital as they perform the basic operational activities that generate the daily outputs of the process-based activities in the HEI. Besides that, UFSM’s public servants participate in the strategic alignment between the objectives of each sector, by using essential processes for achieving them, which goes in line with the postulates of Skrinjar and Trkman (2013). Their work demonstrates the importance of the understanding and commitment of employees.

In such perspective, the public servants understanding and their commitment to the organisation become key to maintain permanent such ongoing pattern. Senior managers need to involve and encourage their employees in a new process management culture (Giacosa et al., 2018), giving them freedom, voice and autonomy to generate endogenous improvement patterns (Thong et al., 2000) and to implement operational discipline (Hernaus et al., 2016). Such “joint understanding” is placed as one of the ten principles of BPM introduced by Vom Brocke et al. (2014) and could smoothen the knowledge management processes and their performance (Balasubramanian et al., 2020). They explain this principle as a mechanism that sustain a common language among the different stakeholders involved in a process, which is essential and has a close connection with process effectiveness. The research’s results corroborate with such postulate.

The “user value” factor has the second greatest significant impact on Process Effectiveness. This can be explained by the fact that the more the focus on the user is inserted in the execution of the processes’ tasks, the more such process tends to generate value for the user himself (either intermediate or end of a process) and the institution (Cavdur et al., 2019; Ferreira et al., 2018). The result corroborates with the postulates of Trkman et al. (2015), which argues on the importance to obtain a clear customer-end process understanding to offer a better customer-oriented service. This is also essential for service change and to delineate service innovation (Gomes et al., 2022). Therefore, obtaining data, electronic services, and information related to a process user can provide greater and better opportunities to add value (Lim et al., 2018, Lim et al., 2019) and, consequently, generate greater Process Effectiveness.

In such perspective, the “identification of activities that do not add value” (F9) to the HEI also proved to be significant in the estimated model. Considering that the value is fundamentally derived and determined by using resources, the identification of activities that do not add value can generate considerable savings in the use of resources, generating greater Process Effectiveness. One of the main reasons for process inefficiency is the “inability” of the employees in dealing with the “real user need” (Gupta & Sharma, 2018). This means, in other words, that employees have difficulties in understanding or identifying activities that do not add value, which consumes resources in unnecessary activities and reduces Process Effectiveness. Such evidence points out the importance of identifying the activities that do not add value to Process Effectiveness.

The “Process Standardization” factor (F5) exerts the third greatest weight in the Process Effectiveness result. The process standardization is related to the standardization of work that seeks the clearest, the most acceptable and efficient way to carry out the tasks in an organisation and that allows the creation of a standard from which the improvements will present concrete results (Liker & Meier, 2006). Work standardization is considered essential for the application of business process management (BPM) models (Rentes et al., 2019), and it is not different at the Federal University of Santa Maria. It becomes crucial for a public organisation not to create a standardization process that prevent public service improvement and creativity, which would hinder the process of innovation.

Another factor that has a positive influence on Process Effectiveness is “Continuous Improvement”, which can be understood as the small changes occurring in the activities that are carried out continuously through the full involvement of the employees. In the public sector, the continuous improvements arise from many small changes instead of the radical ones. Consequently, orientation towards organizational objectives must always be considered in continuous improvement actions (Maldonado et al., 2020). Thus, the impact on the Process Effectiveness can be associated with the fact that, through continuous improvement activities, everyone in an organisation is given the opportunity to “give a hand” in achieving the organisation’s goals and objectives (Kumar et al., 2018) for the best service quality provision. For that, it is also important to get the students’ feedback once continuous improvement has a close relation to customer value. In this sense, Waterbury (2015) argues that continuous improvement should be part of the performance review process in HEIs. Therefore, it can be understood that implementing management methodologies such as the process-based approach really requires an effort by the civil servants to change their conceptions and their way of working, since it becomes more effective when frontline people are engaged and involved in continuous improvement and problem solving. Skrinjar and Trkman (2013) postulated that public servants will need to incorporate a new way of thinking to participate and implement process management schemes.

Finally, the “head of sector” control variable has a significant influence on Process Effectiveness. This is understandable as any civil servant in charge of management accumulates greater responsibilities and must be more responsive to the sector’s demands. The head of sector is normally the first person to be responsible for what happens in its unit. In addition, the position of chief usually requires that the individual has more experience and greater process knowledge surrounding their department. Thus, their knowledge and activities have a positive impact on the Process Effectiveness.

So, this study increases and strengthens the understanding about the measures to use to achieve greater Process Effectiveness in public HEIs, and to deal with the implementation of such practices for better effectiveness, which needs to consider the balance between specific particularities of each organisation and its contingencies (Vom Brocke et al., 2014). This paper presents and provides such balance of factors that can direct the best Process Effectiveness in major public HEIs.

To the best of our knowledge, this study is one of the first that extends the understanding of specific process-effectiveness measures, based on BPM approach predictors, and very closely aligned to the lean philosophy. In addition, it provides the analysis of a new and innovative implementation case of an administrative reform project based on a process-based approach, in a public Brazilian HEI.

Nonetheless, the public sector has its own peculiarities that may facilitate or complicate some transformations. The Brazilian public service encompasses bureaucracies and procedures provided by the law, where it may become more difficult to eliminate activities that do not add value because of these characteristics (Manfreda et al., 2014). Consequently, contextual factors and organizational characteristics become relevant as added value assets to implement business process approaches and to get more effectiveness. The results show that, although the traditional culture of the Brazilian public sector does not strengthen the use of Lean Management processes or other practices (Almeida et al., 2017), it generates effectiveness in public activities in Brazil, more specifically in the public HEI.

Conclusion

Process-based management has been implemented at the Federal University of Santa Maria as a way of obtaining improvements in specific sectors and to produce agility in the execution of its activities. Its implementation required a new way of thinking in the organisation, pushing the upper management to recognize the importance of the critical factors that influence process effectiveness, and to use them as key elements for the personnel in their professional activities, considering that both the academic and regional communities will benefit from such new process management configurations. But this form of management has become even more challenging due to the bureaucratization inherent in the university and the traditionally verticalized organizational culture rooted in well-defined sectors and departments (Hofstede et al., 2005). Therefore, the present study identified which factors can impact on the process-based management effectiveness at the Federal University of Santa Maria.

The empirical research was elaborated, structured and supported by process-based management implementation theory. These factors were evaluated empirically and analyzed in order to obtain consistency for further analysis of their relationship with Process Effectiveness. The results demonstrated a direct influence from five factors of Process Effectiveness: the understanding and the commitment of public servants, the user value, the process standardization scheme, the continuous improvement activities and the non-value activities identification. Also, it has achieved a direct impact to the “head of sector”. It is noteworthy that the values of the coefficient of determination (R^2) show an explanation degree of 57.9% for the observed dependent variable. Therefore, the effort to improve the other factors studied here can have a significant impact on increasing the HEIs Process Effectiveness. The results of this research extend the concepts of process management and the assessments of projects that focus on the effectiveness measure as a dependent variable.

The results of this research have implications on the theory of process-based management effectiveness, especially for the public funded institutions. The factors that were introduced as the result of the factorial analysis may be “the lenses” for other institutions that seek to re-organize their business processes and look for more effectiveness.

Despite spreading good practices and results from the private sector, process-based management theories need further studies to make it accessible and understood. This Brazilian public sector study corroborates with the theory and practice realized by Ongaro (2004), Radnor and Walley (2008), Rendon (2008), Barraza et al. (2009), Antony et al. (2016), and Bisogno et al. (2016). Also, this research shown innovativeness in making an approximation between the process approach and Lean thinking. Both can enrich the field of theoretical and practical study if regrouped together (Ferreira et al., 2018; Maldonado et al., 2020).

Additionally, the contributions of this study are extended to process design and its management, which aim at identifying user-value as essential in a lean paradigm, where process-based management fits. In this research, the essence of lean management to identify the activities that generate users added-value is clearly described, allowing the public servants to identify and to eliminate the activities that do not add value, which are considered as “process-waste”. The present study shows the importance of the effectiveness of process-based management and it reinforces the literature on the subject, as suggested by Womack and Jones (1996).

Finally, this study serves as a mirror for the public funded HEIs that are seeking administrative reforms based on the process approach. The initial results of the Administrative Reform at UFSM shown positive projections on Process Effectiveness and the organizational performance of the institution. Moreover, a university should exploit the image and knowledge established in the market through public sector management, to reinforce the benefits and performance of its own activities.

This research presents some limitations as the data analysis did not include crossed techniques that could have enriched the process analysis, where only one factor analysis method was adopted to identify the dimensions of HEI's Process Effectiveness. Additionally, the fact that the sample is non-probabilistic for convenience must be considered, which does not allow the generalization of the results achieved. Future research proposals such consider these previous limitations as opportunities (specially considering the sample size) and also we highlight the importance of research that directs key elements for the adoption and the implementation of lean practices, as moderators for process-based management efficiency, such as information exchange, willingness to change and process culture. Studies that investigate measures to reduce the barriers and the difficulties in implementing lean practices are also needed.

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