

Identification and analysis of indicators for the coordination of higher education programs in the context of e-learning

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ABSTRACT

In the current panorama, most universities are using LMS with other co-related operational systems to manage and monitor academic programs, courses and associated services, generating big quantities of data. With the necessity for proper information to analyse and supervise clearly and concisely academic programs, and all related tasks, inherently performed by program coordinators, program directors and/or program chairs, it is necessary to select and extract focused indicators of those systems to support, not only in terms on manageability and monitorization, but also to support decision making.

With this rationally, this work surveyed the literature to extract, identify and select major indicators (or key performance indicators, KPI) which can be used to model a decision-support system to help academic program coordinators.

The primary research question was “What indicators are relevant to support the coordination/direction/chairing of higher education programs in the context of e-learning?”. It was pursued via a Systematic Literature Review that analysed current studies and theoretical background consolidation focused on establishing what these roles are and what roles they serve. I.e., what’s a program coordinator or program director or program chair does. All the information was merged to build sufficient knowledge to answer the research question.

As an outcome, the extraction, selection, and analysis of the research literature dataset determined 27 different themes of indicators relevant to the management of programmes within an e-learning context, grouped under 5 categories, which were mapped with the theoretical background. This enabled an identification of the current alternatives to build decision-making tools for these professional roles, but also highlighted gaps in the literature, for which innovation and research are necessary, towards creating new systems to support the academic program coordination role and its main roles.

KEYWORDS

Learning indicators; program coordinator; program chairing; program director; learning analytics; academic indicators;

1. Introduction

Individuals performing program coordination tasks take on different role names, and different levels of responsibilities, regarding the several tasks and roles that must be performed, depending on their institutional locations around the world. In general, it’s correct to say that they will be a program coordinator, or program director or program chair, and have similar roles (or tasks) related to program management and administrative tasks depending on their university [1]–[19] (this is detailed in chapter 4, as part of keyword analysis). One of the major common roles is to establish the enrolment of students in the program, provide proper communication on when needed and mitigate program obstacles that might happen during the academic year. They assess and monitor the entire program, trying to prevent student breakdowns as individuals or groups.

1.1. Background

It is up to the Program Coordinator/Chair/Director to support the success of all the students during entire academic program [1]–[19] with the ability to provide any necessary aid related to its roles. Coordinating an academic program relies on the monitoring and tasks related to individuals, groups or all students and stakeholders like lecturers and administrative staff all along entire learning process with the major objective of cooperating in the prevention of program failure.

This study refers mostly to a single main research methodology that is going to be implemented to obtain the final goal and answer the research question “What indicators are relevant to support academic programs coordination in the context of e-learning?”. The Systematic Literature Review is the methodology chosen to gather, extract, analyse and provide proper information to reach this study goal and it is described in depth in chapter 3 of this document.

Section 1.2 describes the research problem and motivation where the main issue lies on the lack of feedback or support to academic program coordination. That gap is related to their administrative and non-administrative roles where nowadays, with all the information generated by information systems, it is imperative to extract that information and find the best indicators to fulfil this gap and support the program coordination stakeholders, mainly the program coordinator, director or chair.

Chapter 2 provides a theoretical background with the current terminology on what is program coordination, how individuals performing this role are called and what are their main roles or tasks. This background cross-references sources from 4 distinct countries: Portugal (PT), United Kingdom (UK), Australia (AUS), and the United States of America (USA).

As mentioned above, this document presents a systematic literature review in order to organize and extract an entire a set of scientific studies with the objective of answering all the proposed research questions, in particular, “What are the indicators known to support the academic program coordination?” and “Are those indicators relevant to the e-learning context?”.

We concluded this work by answering the major research question based on the first 2, “What indicators are relevant to support the coordination of higher education programs in the context of e-learning?” and specify generic limitations and future work, as shown in chapters 6 and 7.

1.2. Motivation and objectives

This thesis has a motivational personal nature, starting on the data gathering and analysis and education. The evolution or technology disruption must be used to facilitate all type of process that can or cannot be repetitive used to enhance the decision-making quality, impacting that way, directly or indirectly, teaching and investigation quality.

More and more, systems must be integrated to fulfil daily life problems that people can find, in this case is in terms of management of academic programs focused on program coordinators.

Therefore, by gathering, selecting and analysing the major indicators, enables the “privileged” access to proper information in due time for those indicators to be shown and proper decision making can be implemented on time. This means that Program Coordinators can have more efficient time and focus what really matters for their role, program success and the smooth running of the whole program and academic year for all the stakeholders.

The main objective with this study is to identify the most relevant indicators to support the management and decision-making for program coordination of higher education in the context of e-learning. This process includes the exploration, identification and analysis of what is the role of program coordinator, in Portugal, USA, Australia and UK, and also their main tasks or roles associated to decision-making and relevant information to support those decisions.

It will be taken into account the liability of how and where to find those indicators and the possible limitations behind to obtain that type of data (regarding current information systems and possible data extraction from LMS). As it is, to reach that goal, two research question have been developed to answer the main central RQ as it is possible to view on the table 1.

RQ 1	What indicators are relevant to support the coordination/direction/chairing of higher education programs in the context of e-learning?
RQ 1.1	What are the indicators known to support academic program coordination/direction/chairing?
RQ 1.2	Are those indicators relevant to the e-learning context?

Table 1 - Research Questions

Picking up the case of Universidade Aberta (UAb), the online system is based on Moodle, and it contains information focused on student support and lecturer. This information is segmented by course unit or by student itself, thus this information is not automatically tapped by program coordinators as it could in an efficient way, or they may not even know in what information should they focus or extract.

Since the data is not prepared to support coordination systems, or even because the available indicators don't meet the requirements of program coordinators' tasks, they may not be able to rely on visual interaction or any advanced analytics approach to help on their roles.

The use of SLR serves as agglomeration and contextualization of information that, by including the known and available indicators in other studies [20], was used to answer research questions RQ 1.1 and RQ 1.2 and, it turns out, that we can achieve the main goal of responding to RQ 1.

To conclude, this study enables the possibility to extract and transform focused and necessary information through the available systems for other studies and practical environments and also availability to evaluate the current background in some universities to develop a proper prototype because it's with the exploration of new solutions, improvements in LA and visual dashboarding to academic program coordinators that's possible to actively contribute to science investigation by answering "What indicators are relevant to support the coordination of higher education programs in the context of e-learning?".

2. Problem definition

2.1. Problem Statement

With the increase of data/information quantity being generated by LMS, most of the information is not well structured or too dispersed regarding educational events generated by interaction, direct or indirect, that can't support the management of academic programs or even because they can't even know which indicators should be followed and to be useful to their function and task support.

This said, the cause of the problem, most of the times is to know what a program coordinator is, how they're currently called and known, what are their main tasks and roles. With that, we can consider an initial focus to gather and pursue in terms of information to know where to attack, in this case, indicators to support the academic program coordinators.

2.2. Problem-solving approach

To solve this definitional issue, there are many approaches possible. In this study is possible to have an overview on what is an academic program coordinator, how is it called in different countries and what are the main functions for that role(s).

As referred on the section above, this is an initial process to focus on what's important, what indicators we can consider supporting this role and if they're relevant to e-learning programs. With this, gather information, extract, and evaluate through a systematic literature review is imperative to start and consolidate a great process to communicate the results with the interested scientific stakeholders that are searching for solutions regarding learning analytics in higher education.

3. Theoretical Background

3.1. Nomenclature and characteristics of a program coordinator in the Portuguese context compared to USA, UK and Australia

With the evolution of technology, universities are using tools and advanced systems to operationalize and support, in general, administrative, and non-administrative activities with LMS that enhances academic programs management. Thus, e-learning and hybrid approaches like blended learning are increasing and with the evolution of these systems, it's necessary to evaluate them properly and realize if they're working properly and efficiently [16].

Since the 1980s, it is being identified that higher education levels have been changing during the years regarding the appearance of, more and more, new distance learning programs (Liebowitz & Frank, 2011). But with the capacity of having everything with the distance of a click, online and on the cloud, e-learning approaches and many other hybrid variations of education have been growing, leveraging the paradigm of modern education, changing the previous model of academic education (Sun, Tsai, Fin-ger, Chen, & Yeh, 2008; Wang, Wang, & Shee, 2007). Therefore, is important to measure the success of the LMS to reach proper conclusions of cause/effect and create value propositions in decision operations and manage institutions investments (DeLone &McLean, 2003) [18]. With this, is important to characterize the individuals responsible for the academic program coordination (and courses) among universities and clarify the differences between several countries worldwide, in the case of this thesis, it's focused the comparisons between USA, United Kingdom, Portugal and Australia regarding assigned roles, functions and tasks.

3.2. Role comparison between Portugal, United States, United Kingdom and Australia

In Portugal, the functions to the role of an Academic Program Coordinator arise from general country regulations and each university regulatory statuses or constitutions, so to speak, not all are the same. Each university have their approved regulation in the Portuguese official gazette [3] where it can differ the tasks or functions for the role but they all have in common the main goal of the good management wellbeing of academic programs and it's normal operation ensure its quality [1], [2], [4]-[7], [12].

In terms of research, it's found differences between "Program" and "Programme" to further investigate "Program coordinator" or "Programme coordinator". This designation varies by country and it is merely because it is commonly used on a specific country derived by its grammatical and spelling foundations.

Since we've analysed different statutes and university regulations among different countries, it has been concluded that Program(me) chair has the plausible characteristics (most favourable) and similarities to a Program(me) Coordinator in Portugal but there's almost no information about the role itself, however we have also Program(me) Director as second choice since it reflects the proposed main functions for the role but start to have much more administrative duties than executive or management ones. Last of all, Program(me) Coordination in the USA, UK and Australia refers to a much more administrative role than a Program Coordinator in Portugal so, in this study, its prioritization in terms of searching roles are Program(me) Chair, Program(me) Director and then is Program(me) Coordinator. The selected roles to support the academic program coordinator, director, chair can be seen on table below.

Functions with at least 3 referenced countries
A - Ensure fulfilling of goals defined for the program, considering criteria for scientific and pedagogic effectiveness and efficacy
B - Contribute to adequate program operations, specifically by coordinating the courses syllabi and their academic activities
C - Propose the creation or cancellation of courses
D - Propose and comment on changes to the program's course listing
E - External promotion of the program and coordinate the organization of application processes
F - Represent the program at the institution's governing bodies
G - Draft proposals for staff hiring, and contract renewal or rescission
H - Draft an annual report, following models defined by the Scientific/Pedagogic Council of the institution
I - Develop communication channels with students, towards permanent information update and exchange of viewpoints

Table 2 - Roles/Functions that appeared at least in 3 different countries

4. Performing the SLR

4.1. Planning

To start the literature review, is necessary to adopt a range of rules or a set of follow-up lines with the objective of having a reference scheme where it enables the actual status during the review [20], [21]. To that extent, the research protocol starts to determine the text or reference wordings to be searched that are going to be used on the search engines and libraries with in order to obtain the biggest number of results of studies that might contribute to help and support the proposed research questions in this study.

To this study we relied on the software "Harzing's Publish or Perish" to search Google Scholar libraries since it is a reliable and scholarly material only library with a very good coverage of English and non-English sources, as well as Open Access studies held in institutional repositories with the ability to view of how many times a specific article has been cited by others [22]-[25].

Derived from the analysis between different roles and functions across Portugal, USA, UK and AUS, it was possible to use the wordings below to search:

Scope	Words to search
Higher Education	"higher education" OR "academic program" OR "academic programs" OR "university" OR "college" OR "faculty" OR "academic programme" OR "academic programmes"

Program/Course Coordination	"course management" OR "program coordination" OR "program chair" OR "program chairing" OR "program coordinator" OR "program director" OR "program direction" OR "program coordinating" OR "programme coordination" OR "programme chair" OR "programme chairing" OR "programme coordinator" OR "programme director" OR "programme direction" OR "programme coordinating"
Analytics & Measures	"analytics" OR "indicators" OR "metrics" OR "dashboard" OR "dashboards" OR "instruments" OR "measures" OR "kpi" OR "analysis"

Table 3 - Scopes and search strings

After querying and having initial results, is necessary to apply the inclusion and exclusion criteria in order to reduce the sample of articles found in the library to only keep relevant ones and start narrowing the pipeline of studies to evaluate, in this first interaction of this study, it has been interpreted the following criteria:

Inclusion	Exclusion
<ul style="list-style-type: none"> • Only articles/Studies from last 5 years • Documents related to higher education, program coordination and indicators/KPI's inside the scope of the outputs of chapter 3 related to the role functions/tasks by title 	<ul style="list-style-type: none"> • Not being from the last 5 years • Not in English, Portuguese or Spanish • Not related to one of the topics of the search word cloud from table 6 • Not accessible online • No duplicates

Table 4 - Inclusion and exclusion criteria

After having the criteria's, a revision protocol took place to have the final list to conduct the review. By applying the search criteria on the referred libraries of the revision protocol, it is possible to observe on the figure 3 that were found 465 scientific documents in total for American English strings and 282 documents for British English strings. After applying the filter for the last 5 years it has kept only 123 documents for American English and 39 for British English that led to a 162 scientific documents in total, after removing duplicate 122 documents were left to be analysed and after checking it by title and applying the inclusion and exclusion criteria, 40 were selected and after doing the same for the abstract, only 29 remained to be evaluated for further analysis of this study.

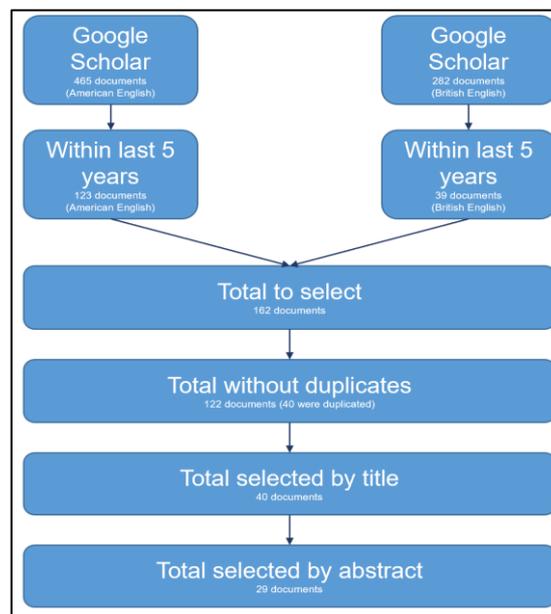


Figure 1 - Study selection process

5. Results and Discussion

5.1. Communicating results

A cross-checking needed to be done between the functions of a program coordinator and the information of extracted documents. To do this "We followed the process prescribed by Vaismoradi et al. [Vaismoradi,

Jones, Turumen and Snelgrove 2016], who recommended use of qualitative, thematic techniques to collect and analyze data to yield meaningful, credible, and practical results.” [26].

By applying the method, 46 raw indicators that were extracted by comparing all the content related to course/program chairing/directing or coordinating functions analysed before on chapter 3 that appeared at least in 3 countries simultaneously. As an auxiliary method during this process of extraction, all raw indicators were mapped to their matching coordination role, creating a matrix of the extraction of raw indicators to support the coordination of academic programs.

As it is possible to note, roles A and B are the ones where it is possible to find more related information or citations about a program coordinator indicator and in 3rd is role H related to the annual model reports to be defined by the scientific-pedagogical council, on the other hand but not less important is the role C, D, G and I than had less than 4 references in the entire dataset where role E and F didn't have any indicator collected.

5.2. What are the indicators known to support the academic program coordination?

After having the list of indicators and to support answering the research question, is necessary to define themes regarding its properties of “serving as a main product of data analysis that yields practical results in the field of study” [27] and it's used as a descriptor or as an attribute to explain a specific concept. Each indicator has been analyzed and interpreted in an abstract and implicit level deriving from intellectual and effective content [27]. A comparison level approach was possible to relate with similar or different extracted concepts resulting in provisory themes which were compared by name and definition to check if there was an overlapping, a merge possibility or even a separation process. With this iterative process, it is possible to achieve more and more abstract or concrete level of analysis for qualitative content depending on what is the necessity or goal at that point of the study.

Table 5 shows that from 46 raw indicators extracted from previous procedure, 26 different themes emerged from reading and immersion and it can be shown more in-depth on appendix 4 [[26], [27].

Theme nº	Themes
1	Program and Course Contents
2	Sufficient Control Over Selection of Module Leaders
3	Teaching Availability
4	Course Coordination
5	Student Outcome Level
6	Student Attrition Rate
7	Student Achievements
8	Quality of Teaching Materials
9	Program and Course Coaching
10	Lecturers Enrolment on Professional Development
11	Students Interest
12	Student Satisfaction
13	Student Outcomes
14	Student Time
15	Student Motivation
16	Learning Materials
17	Providing Teaching Support
18	LMS Availability
19	Student Development Level
20	Class Achievements & Performance
21	Student Collaboration
22	Student Engagement
23	Student Retention
24	Student Quality
25	Students Potential
26	Student Effort

Table 5 - Program coordination indicator themes

5.3. Are those indicators relevant to the e-learning context?

In this thesis, the e-learning concept relies on every single way of teaching and learning outside the border of the physical learning (or classroom teaching), not only focusing on tools, but also on different ways to communicate, different approaches to educational processes and also the opportunity to leverage educational institutes by giving the opportunity for abroad students to enrol in a different set of programs

without the need of being there physically [28]. This is possible to achieve with the help of information technology and new ways of thinking in which software and platforms are being used to leverage this type of learning and also enables analytical properties to be able to extract useful information about the academic programmes [29].

This said, and since this study relies on program coordination roles extracted from official statutes from universities that have e-learning component [1]–[14], [17]–[19], [28], [30]–[34] and, one of those that is important to mention (Universidade Aberta) by its core functionality on e-learning and distance learning programs/courses and it references 7 of the 9 roles, it can be said that all the indicator themes extracted above are relevant to the e-learning context because the evaluation and extraction criteria were met based on those roles.

6. Results Analysis

At the beginning of this study, a state of the art was carried to analyse and transcribe the role of the program coordinator (or chairing or directing) into actual functions or generic tasks.

Knowing the nomenclature and characteristics of a program coordinator was needed to assess on how to search for the role and extract information from universities like Portugal, UK, USA and AUS and merged that information to be able to have an overview of the functions to support the program coordination role.

Initially there were 23 directly extracted functions and without duplicates it ended up with a list of 17 functions. To be more precise in terms of extraction process for the SLR, the main criteria to select and evaluate on the dataset was based on the functions with at least 3 references out of 4 countries and from the 46 raw indicators, it was possible to identify that Function A, B and C were the ones that matched the most with 32, 34 and 17 respectively, others were below 3 matches and there was no representation for function E and F. When it comes to indicator themes, instead of 46 raw indicators, we extracted 26 indicator themes evaluated to match between function roles with the process of Vaismoradi et al. [Vaismoradi, Jones, Turumen and Snelgrove 2016] where it was used coding and immersive analysis to develop the qualitative thematic analysis. [27]. With this mapping between roles and themes, it was possible to verify that the same representation happens (for raw indicators) where we have 3 main groups with function A and B leading the way with 35,59% of matches each (71,18% both), next is function H with 18,64% and then merging all the other functions (C, D, G, I) are represented with 10,17%. Still, function E and F are not represented.

To conclude the results analysis by comparing the state of art with the systematic literature review, it is possible to share that indicator themes about the function A and B are fulfilled and well represented (more than 70%) and also themes related to function H is also represented in this study. Regarding others, needs to have more field research to have more information about these indicators among these functions, since in a total of 9 generic roles/functions to support the coordination of academic programs, only 3 are represented in this study with almost 90% of representation. So there's a big window to work among the literature and it is important to mention that function C, D and E are noted in statutes of the 4 countries so it states the importance of having information and indicators to fulfil this gap.

7. Conclusions and future work

This research allows to assess what data can be extracted regarding program coordinators and its indicators or KPIs. It is presented what is a program coordinator in three different countries based on legal documents that states their main roles or tasks and there's a future possibility to have a field research to improve improve the level of knowledge in terms of learning information systems or even about gathering statutes in more and more academic institutions with the ability to survey different program coordinators to extract different tasks and functions of a daily basis that are not considered in this study.

With that, it was conducted a systematic literature review to extract, select and find useful information to draw conclusions on what are the indicators related to those roles, doing qualitative analysis on finding themes and clustering.

Focusing on the main objective of this thesis and answering the main research question "What indicators are relevant to support the coordination of higher education programs in the context of e-learning?", everything was addressed and comprised in this study that led to discover all the 26 indicator themes grouped by 5 different categories and all relevant to the context of e-learning since all the extraction criteria

and result analysis was based on it since the theoretical background of this study and all the mappings between all the extractions and program coordination roles.

In this study, it is possible to observe that among 26 indicator themes stated on chapter 5 extracted by an SLR including the state of the art extraction criteria by having a match on different roles to support the program coordination, only 3 out of the 9 main functions shown in this study are well represented with indicators that leads to a lack of information among scientific studies about this topic.

To conclude, it is possible to note that compliance of the objectives and contribute to the proper functioning of the program are the most represented indicators in this study with the main focus on the student, where we can say that 15 themes are related to student's and the other 11 themes identified are regarding the courses, contents and the academic programme itself, which leads to an opportunity for future work to find which indicators are more relevant and classify them by relevancy or priority of analysis since there's a lack of information or indicators on roles stated on chapters 5 and 6 of this study with the "Student" level theme indicator representing more than 50% of the overall, so there's a gap to fill about having more information regarding administrative roles and coordination roles that aren't directly connected to students.

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