MATCHING THE CONTROLLER ROLE: INDIVIDUALS VS COMPANIES

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Abstract. Finding a good match in the C-Suite is critical for maximizing business value and capitalizing on competitive advantages. This study analyzes the roles of controllers in organizational descriptions and executives' profiles, as they both define the position and craft the profession. This paper proposes a framework to describe and classify the existing controller types based on an extended review and description of the available literature. Then, using a clustering method based on the semisupervised *k*-means, we mapped a sample of 45 controllers to their dominant profile and contrasted individuals' characteristics against the companies' definitions of the role. This study reveals that the understanding of the types of controllers, which is usually presented as a dichotomy, may lead to mismatches between what is needed and what is performed. The clustering analysis reveals a significant mismatch between individuals and the organizations defining the role. The framework and clustering method could be used for multiple purposes, such as evaluating what type of controller an individual is or a company needs, which would improve recruitment processes to achieve better matches. The framework expands the identification of controllers from a dichotomy to a gradual classification and describes four controller profiles. This perspective further describes the role and validates the framework using data mining tools.

Keywords: managerial accounting, controller profile, controller role, recruitment and selection, professional development, clustering profile.

JEL Classification: M12, M41, J44, L84, O15, C82.

Introduction

In the rapid and more recent evolution of management control theory and practice, the definitions of the roles and responsibilities of the highest-level professionals and executives working as *Controllers* has changed and adapted, ranging from archetypes named *bean counters,*

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scorekeepers, and watchmen to *consultants, advisors* and *business partners* (Colton, 2001; Graham et al., 2012), with important variations according to the business unit (Indje-jikian & Matějka, 2006; Morales & Lambert, 2013) or the geographical location of the company (Azan & Bollecker, 2011; Goretzki et al., 2013; Guenther, 2013; Janin, 2017). The role, however, has usually been presented as a dichotomy between the *bean counter* and the *business partner* (Janin, 2017), but the literature recognizes the need for a better understanding of the factors causing the variations of the role (Hartmann & Maas, 2011; Lambert & Sponem, 2012). Fourné et al. (2018) studied the definitions of controllers' roles and developed scales to empirically test three roles – *business partner, watchdog,* and *bean counter* – while Lambert and Sponem (2012) found four types of roles – *discrete, safe-guard, partner* and *omnipotent* – according to the authority and internal client's definition. Failing to match the right profiles would produce gaps in the performances of companies and frustration for individuals, and educational institutions could miss the focus of the evolution and over/under emphasize the abilities, skills and tools that professionals and organizations need to succeed. Our motivation is to describe and conceptualize the options that companies and individuals face when defining the position and crafting a professional career, since the archetypes identified in the literature and management control theory indicate that there are intermediate expressions of the role (Byrne & Pierce, 2007) as companies define it and as professionals perform it in a way that is affected by both parties (Hopper, 1980; Lambert & Sponem, 2012; Rieg, 2018). Hence, the research questions that the authors aim to answer are the following: What are the different types of controllers and their characteristics? Which factors shape the type of role that controllers perform in an organization? Once these factors are found, are these factors good predictors for identifying the types of controllers? How similar are the individuals' characteristics and the companies' needs for the role? By answering these questions, we will be able to conceptualize the types of profiles that better fit the organizational contexts and provide a means for companies to better describe and promote the type of controller they need. Professionals in the field may use our results to make informed decisions and shape their careers, and educational institutions may revise the designs of their academic and specialization programs to satisfy the new and future demands of companies for the management control function. Management control theorists may also find the classification useful when further studying the construction of the profile and the roles of controllers and management accountants in organizations.

The authors conducted an exploratory sequential study with two main stages to answer the research questions. The first phase of the study provided a description of the different controller roles by synthesizing the literature in a conceptual framework of controllers and validated the framework with scholars and top executives in the area. In the second phase, we used the conceptual framework as a theoretical base to design a questionnaire and to collect empirical data to classify a sample of controller executives using a clustering technique.

The structure of the remainder of this article is as follows. The next section introduces the differences in the understanding of the controller and presents a synthesis of the literature on controller profiles. Section two, develops the first phase of the research, and presents a validated framework. The third section describes how the framework is used to classify a

sample of controllers from two perspectives: the characteristics of individuals and companies' definitions of the role. Then, in section number four, a comparative analysis between the perspectives of individuals and companies is performed, section five presents the discussion and limitations of the study; and finally, the conclusions are presented.

1. State of the art

The term "controller" has been used to identify different professionals who analyze data and produce information to support decision-making processes. The appearance of controllers in companies is usually related to accounting, since accountants have transitioned from recording data for financial analysis to management accounting to support decision-making. Some studies name this role the *financial controller* (Graham et al., 2012), others name it the *business unit controller* (ten Rouwelaar et al., 2008), and others name it the *corporate controller* (Zoni & Merchant, 2007). The role of controllers is also associated with a broader and more strategic function that seeks to maintain the logic and rationality in decision making processes by adding value to the managerial and administrative tasks and being the anchor that deploys the business strategy in the literature that studies the *business partner* (Goretzki et al., 2013; Granlund & Lukka, 1997; Janin, 2017; ten Rouwelaar et al., 2018). Technological advances facilitated the accomplishment of the role defined in the early 1970s as a qualified analyst and as a reasonably precise forecaster (Crampton, 1970) who, due to the digitalized and integrated information systems, focuses more on the analysis and interpretation of information floods coming in high volumes, velocity, and variety from all the functional areas, than on the mechanical tasks to collect data, and manually process them (Bergmann et al., 2020; Chapman & Kihn, 2009; Vitale et al., 2020). Such changes moved the role from an initially operational level described as a "bean counter", "score keeper" or even "watchdog" to a strategic position called a "business partner", "consultant" or "business advisor" (Baldvinsdottir et al., 2009; Granlund & Lukka, 1997; Pasch, 2019; Yazdifar & Tsamenyi, 2005). The changes in the discipline progressively shifted the focus of decisions from an almost exclusive financial perspective to an integrated view of a company that produces information to support decision processes leading to strategic actions (Quattrone, 2016) and recognizes a purposeful influence in the organizational behavior in the design of management control systems (MCS) (Kaplan & Norton, 1996, 2008).

The cost accounting specialization soon evolved into managerial accounting and management control, thereby launching accounting analysts to tactical and strategic levels (Colignon & Covaleski, 1988; Granlund & Lukka, 1997; Henttu-Aho, 2016). The new position both supposes the facilitation of information for decision making and ensures corporate integrity in the financial, customer, supplier, environmental and regulatory domains, thereby shaping and impacting the organizational dynamics of planned performance and results. Alternatively, the emergence of this role has been associated with the idea of the cybernetic control of MCSs implemented simultaneously in a number of processes and areas of corporate performance to provide alerts and align the use of resources. In this view, controllers are responsible for the design, implementation and proper functioning of the MCS and for the opportune production and use of information.

The emergence of controllers is facilitated by the availability of data and computer technologies, but it is mainly explained by the increasing need to control and maintain the consistency of decisions, actions, resources and objectives in dynamic business environments. Hartman and Maas (2011) propose that the controller's role is to ensure the rationality and accountability of corporate decisions, thus making this role crucial when companies face crises. In a sense, controllers could be seen as a necessary and functional barrier to business agility, since they may restrict the freedom of managers (Ezzamel & Burns, 2005) and permanently challenge business performance and results (Johnston et al., 2002); however, the role can be perceived as functional if it appropriately aims to ensure that risks are managed to achieve company endurance and results, according to the corporate context and needs (Aaltola, 2019).

2. Conceptualization of the controller role

Along with the evolution of the field and the changing organizational dynamics, the skills, tools and capabilities needed by a professional in charge of management control functions contains ambiguities, complexities and challenges to be solved by companies and professionals (Burns & Baldvinsdottir, 2005; Byrne & Pierce, 2018). The available literature on controllers and managerial accountants contains a large collection of responsibilities, performance areas and archetypes associated with the role, but it has not yet provided clear distinctions of the archetypes or indicated which type best fits a given context. A few studies have explored and qualitatively analyzed the controller role beyond the usual dichotomy of *bean counters* and *business partners*, and these studies agree on the need to further understand the role (Baldvinsdottir et al., 2009; Byrne & Pierce, 2007; de Loo et al., 2011; Hopper, 1980; Lambert & Sponem, 2012) and to deepen the understanding of the company-individual dynamics that shape the roles of controllers (Hopper, 1980; Lambert & Sponem, 2012). The main and most generic role of controllers is to deploy the corporate strategy (Kaplan & Norton, 2008); thus, the responsibilities defined for the role are the following: a) provide information to support decision making, b) help to reduce the divergence of individuals' and units' objectives with respect to the organizational goals, and c) supervise the use of resources to guarantee competitiveness. In these tasks, significant attention is paid to using accounting and financial information to produce reports for insiders, such as managers and company executives (managerial accounting), and for outsiders, such as shareholders, financial institutions and supervising institutions (financial accounting). The controller must also consider using nonfinancial and qualitative measures to support decision making and to participate in the monitoring, consulting, coordination and management of change at different organizational levels (Bollecker, 2007). Thus, the MCS becomes a tailor-made function for the particular organizational context, stage and leadership at a given point in time, which is the reason why the role has been identified with a number of archetypes. To customize the role, specific tasks focus on planning, monitoring, reporting, data analysis and interpretation, performance assessment and consulting; however, these tasks are emphasized or reduced according to the stakeholders' needs and culture (Goretzki et al., 2018). In the US, the role seems to be oriented more towards financial monitoring, while in some European regions,

controllers are not responsible for financial accounting or reporting. In France, controllers are strongly related to budgeting, managerial accounting, statistical and economic analyses and long–term planning (Azan & Bollecker, 2011; Guenther, 2013); however, in the UK, the focus is on financial discipline, and in Germany, the focus is on operational quality and safety (Janin, 2017). Such theoretical, cultural and practical differences represent a challenge for the definition and construction of archetypes and the interaction of individuals who work as controllers and the companies that hire them to deploy their corporate strategies (Byrne & Pierce, 2018).

Different criteria could be used to conceptualize the types of controllers. A first distinction is found in Anthony (1965) and is followed by a number of publications (Järvenpää, 2007; Kaplan & Norton, 2008; Ye et al., 2009) based on the organizational approach to the MCS. The reports indicate that organizations can be reactive and operational about management control, focusing mainly on using accounting information systems with past data to measure performance (Argyris & Schon, 1974). Conversely, organizations can be proactive and strategic by escalating the scope of the area to include the modeling of future behavior and the measurement of organizational results as a continuous process to effectively deploy the business strategy with feed forward information, cultural/organizational design and behavioral influence (Flamholtz et al., 1985; Merchant, 1985).

More criteria to describe the role based on classifications (Table 1) have been provided by several theorists (Baldvinsdottir et al., 2009; de Loo et al., 2011; Goretzki et al., 2013; Granlund & Lukka, 1997; Indjejikian & Matějka, 2006; Sathe, 1983; Seal, 2006); these theorists distinguished controllers using a monitoring function where the technical abilities are the key to analyzing and processing the quantitative indicators to ensure the accuracy of financial information. Conversely, controllers can be defined as a service function, where the business view, communicational abilities, and interpersonal skills dominate in the role of controllers to assist the executive leaders in strategic decisions regarding business strategies and plans.

Table 1. Types of controllers by organizational approach to management control

	Operational & reactive	Strategic & proactive	Monitoring	Service	Centralized	Decentralized	Operational efficiency	Business value	Past	Future
Business Partner (Goretzki et al., 2013; Meijerink, 2016; Siegel et al., 2003)		↗						↗		↗
Business Advocate (Jablonsky et al., 1993)								↗		↗
Consultant or Advisor (Holm & Thorstensson, 2013)				↗				↗		

End of Table 1

	Opera-tional & reac-tive	Stra-tegic & pro-active	Moni-toring	Ser-vice	Centra-lized	De-centra-lized	Ope-ratio-nal effi-ciency	Busi-ness value	Past	Fu-ture
Business Unit Controller (ten Rouwelaar et al., 2008)						↗				
Financial Controller (Graham et al., 2012; Granlund & Lukka, 1997)			↖		↖		↖		↖	↗
Navigator (Goretzki et al., 2013)				↗		↗				
Service aid (Hopper, 1980)				↗						
Watchdog – Watchmen (Verstegen et al., 2007)			↖							
Corporate Policeman (Hartmann & Maas, 2011; Jablonsky et al., 1993)			↖				↖			
Bean counter (Friedman & Lyne, 2001; Granlund & Lukka, 1997)	↖		↖						↖	
Score/Book-keeper (Goretzki et al., 2013; Hopper, 1980; Meijerink, 2016)	↖		↖	↗					↖	
Historian – Reporter (Granlund & Lukka, 1997; Verstegen et al., 2007)							↖		↖	

After combining the many available criteria, we identify four different types of control-lers and label them as information source, operational controller, coordinator, and business partner, which are used to frame the archetypes found in the literature. The four types of controllers are incremental in terms of their responsibilities, required abilities, and organiza-

tional levels in which they are positioned. The framework was first evaluated and validated by three scholars in individual sessions and by managers in an executive master's program in management control. These participants suggested specifications based on the association of the abilities and responsibilities with the four profiles. The framework presented in the figure is the final validated version. Here, we describe the types in detail, associating the main features and responsibilities to each type and organizing the profiles in a conceptual map, presented in Figure 1.

The first and most elementary type of controller combines the archetypes identified in the literature as the *bean counter, scorekeeper,* and *historian.* S/he is expected to influence the design and be responsible for the exploitation of the information systems in the organization (Burns et al., 2014), for the construction of standard reports for internal and external users, for the construction of ad hoc information on demand to represent the economic state of the company, and for the design and maintenance of the financial-cost-budget-accounting systems. To succeed in the position, this controller needs to master the technical skills related to cost control, use of information systems, data analysis, and report design, and the controller must also be proficient in communicating sensitive information with an internal user orientation. We identify this type of controller as the *information source*.

A second type of controller uses the information to monitor business processes, operations and overall efficiency of the resources' use, hence emphasizing planning and monitoring responsibilities. This type is usually presented in the literature under the archetypes of *corporate policeman, watchdog*, or *watchmen*. The main tasks for this type are the analysis of budget construction and execution, business process optimization, and operation planning and monitoring. The competencies required for this type of role are process optimization and resource organization skills, in addition to being an expert in business operations. The foci of the communications are expanded to the external users of information (regulators, auditors, shareholders, customers, suppliers, etcetera) to gain credibility in the entire organization, and we call this type the *operational controller*.

A third type of controller is the *coordinator,* who uses information and managerial tools to align resources and people in a proactive manner. The responsibilities of a *coordinator* include designing and maintaining mechanisms to measure and influence performance, facilitating and supporting communication and coordination, and safeguarding the strategic alignment of the different business units, including departments and individuals. With a more complex set of abilities and skills, the coordinator should be an expert in the business sector/domain where the company operates, understand how to influence human behavior, excel at negotiation, and exhibit systemic thinking. The archetypes in the literature that relate to this type are the *navigator*, *financial controller* and *service aid*.

A *business partner* controller is proactive and a strategist and is also referred to as a *consultant, advocate* or *business advisor*. Beyond controlling, the *business partner* is expected to develop and use managerial and business skills and be responsible for ensuring the organizational sustainability and growth to protect the interests of stakeholders. S/he participates in the formulation and design of the corporate strategy and initiatives and must ensure the decision making objectivity at the C-level. The business partner is defined by his/her commercial and entrepreneurial thinking, independence, persuasion, influence and leadership.

Figure 1. Conceptual framework for the controller profiles

3. Classification of controllers

The framework is used as the theoretical basis for the classification of a sample of professional controllers. The definitions of controller profiles are used to categorize the sample of individuals obtained by a survey. Then, a classification procedure is implemented based on the work of La Paz et al. (2019), whose novel clustering method groups the sample using profiles with a semidefined set of variables and allows the undefined variables to iterate and fill the null values as the algorithm learns. Finally, we compare the classifications of the datasets and discuss the results.

3.1. Survey construction

The survey translated the framework's elements into multiple-choice questions. Each individual was asked for information about their abilities, responsibilities and agenda priorities, as well as about their organization and position, like company size, sales level, span of control, hierarchical level, participation in the company's strategy definition, years of experience as a professional and as a controller, and academic background. We retrieved these data based on the results obtained by Rieg (2018), who also stated the need for more studies about the relations of these variables and the type of controller roles.

3.2. Obtaining the sample

An invitation to participate in the survey was sent to controllers hired in different industrial sectors. The controllers were identified first using the personal contacts of the authors and then using an online professional network platform. An approximate response rate of 12% yielded 45 complete responses, obtaining a dataset with 58 variables.

Using the International Standard Industrial Classification (ISIC), most of the surveyed controllers worked in companies in wholesale and retail trade (section G), transportation and storage (section H), and agriculture, forestry and fishing (section A). Using the European Commission's definition of enterprise sizes, 60.0% of the controllers worked in large companies (more than 249 employees), and the rest did in small and medium size enterprises. Considering sales per year, 75.6% of the sample worked in companies with sales above USD\$ 4 million, 2.2% were hired by enterprises with sales less than USD\$ 1 million, and the rest worked in organizations with sales between those thresholds.

3.3. Semisupervised Clustering Algorithm

Data-based approaches can be used to cluster observations into groups. Clustering algorithm is a well-known technique, developed in the data science fields, where unlabeled data is fed into an algorithm for identifying untargeted observations from patterns (Mirkin, 2016). The literature documents several clustering algorithms and approaches. To name a few, the hierarchical procedures group the elements of a sample considering the similarities and differences (Johnson, 1967); the density-based assess the compliance of a minimal number of neighbors within a radius (Ester et al., 1996); and, with a simpler approach, the centroid-based algorithms cluster observations identifying a predefined k number of representatives and assign each observation to one centroid – k-means is one of the most used (Arora & Varshney, 2016).

According to our research objectives, it is apparent that k-means, with a semisupervised approach, is the most suitable. There are two main reasons. First, this approach permits to semi-define initial centroids, and then, each observation is assigned to one group as the algorithm identifies the final centroids' values dynamically by analyzing the data. Second, its simplicity and the current computing power of technology makes it feasible to create several grouping solutions (partitions) and identify a final clustering considering the whole set of partitions by a voting system, obtaining hence a better-quality solution compared to a single grouping. It can be tempting to relate such description to an ensemble clustering algorithm (EC) (Alqurashi & Wang, 2019; Fred & Jain, 2005), however, it has some differences. The major is that most of EC algorithms, after obtaining the set of partitions, find a final partition by using a consensus function, such as the cooccurrence in grouping amongst pairs of elements, and then, cluster objects according to their similarities/differences, like the hierarchical clustering's approaches (notice that the results of the consensus function are used for identifying the final partition, hence, the original features are not considered). In our case, if an EC approach was used, during the consensus stage, the relationships between the controller (elements to group) and semi-predefined profiles (centroids) are somehow lost.

Given the exploratory nature of our controller profile framework, we followed the method presented in La Paz et al. (2019) by implementing a semisupervised clustering algorithm based on k-means, in order to classify a dataset of controllers into the profiles presented and explained in Section 2, considering each controller profile as a centroid, and identify their new attributes through the clustering process, this is, k centroids are partially defined in the conceptual framework for the controller profiles. Our semisupervised clustering method assumes that k centroids start with $n < m$ defined attributes and $m - n$ are unknown, where m is the total number of features for each z observation in the X dataset, therefore, each

initial centroid and observation are represented as v_k^n and as x_z^m. Then, the n unknown attributes are calculated as the z observations are assigned to clusters. This assignment is done by calculating Euclidian distances between observation and centroids (D_{kz}), and then, the membership degree of each observation is set by evaluating the distance between x and v, defining as 1 if v is the 'nearest' or 'similar' to x, and 0 otherwise. After each assignment, the k centroids' attributes are updated by calculating the mean of each m attribute of all x_z^m observations assigned to the centroid v_k^m. Notice that $m-n$ attributes are unknown until at least one observation is assigned to the cluster (see Figure 2). The proposed semisupervised k-means algorithm that creates a partition is shown in Figure 3.
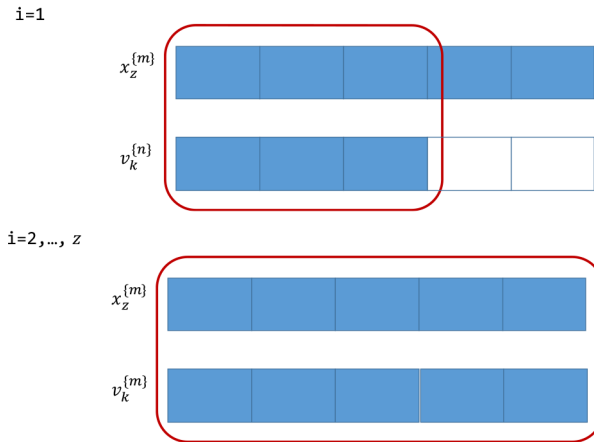

Figure 2. Initial v_k^n versus v_k^m centroids

```
set  K
set  X_zm
set  V_km

For  i = 1 to z {
    calculate  D_kz      :matrix distance between x_z^{m} and v_k^{n}
    calculate  P_kz      :membership for each pair {x_z^{m}, v_k^{m}} according to D_kz
    update     V_km      :update centroids v_k^{n} using P_kz and X_zm
    update     n         :update the number of attributes n for each v_k^{n}
}

print    P, V
```

Figure 3. Pseudocode of a semisupervised algorithm based on k-means

The final values of the centroids strongly depend on the assignment order, which also affects the clustering results. One application of the algorithm is considered as a "cycle", and its result as a partition. This method implements $y > 1$ cycles and computes the final assignment to a given cluster using a simple voting system that assigns the observations to the centroids with the highest total frequency considering partitions. In our semisupervised method, the convergence is evaluated using two criteria: (1) a fraction of the dataset, equal or more than α, does not change the computed final assignment, and (2) every observation is assigned to only one centroid. Figure 4 depicts the scheme of our semisupervised algorithm.
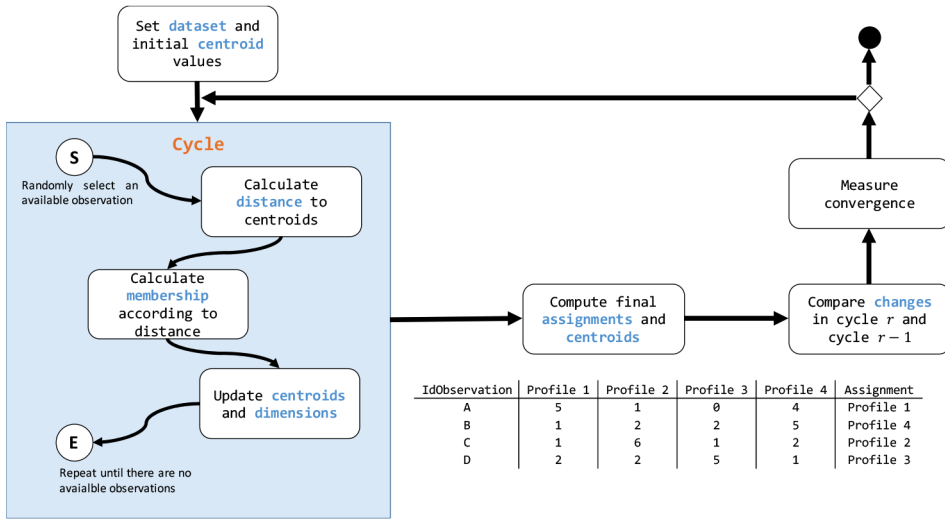
Figure 4. Clustering scheme of the semisupervised *k*-means method

3.4. Semisupervised classification application

The data preprocessing and the semisupervised algorithm were implemented in RStudio, an integrated development environment (IDE) suite for R programming language. Our method requires the use of numerical variables, hence, the sample dataset was transformed into a numeric matrix and divided into two datasets: one for organizational definitions and the other for individuals' characteristics. The organizational definitions dataset was composed of 24 variables on corporate controllers' responsibilities (represented by the controller's agenda), the role in the company, span of control, organizational position, and participation in defining the corporate strategy. The individuals' characteristics dataset included 26 variables about abilities, years of professional experience and in the role, and academic backgrounds.

In the preprocessing procedure, all the variables were transformed into a [0, 1] range for scale effects reduction, and we set known and null subsets for each dataset. In the case of individuals' characteristics, the known values were the abilities identified from the survey, and for the organizational definition, the known values were the responsibilities in the dataset. The remaining variables set as null were the role in the company, span of control, organizational position, years of experience, and participation in defining the corporate strategy from the organizational definition dataset and years of experience and academic backgrounds from the individuals' characteristics dataset.

Once the data were transformed and the known and null variables set, the algorithm started to cluster each observation to their dominant profiles represented by the centroids with the known variables. In our implementation, we set α as 0.05, and the performances were better than La Paz et al. (2019), since our algorithm reached convergence in the classification process after the 15th and 21st partition (see Figure 5) compared to the 150th in their implementation. These results are discussed in the following section.
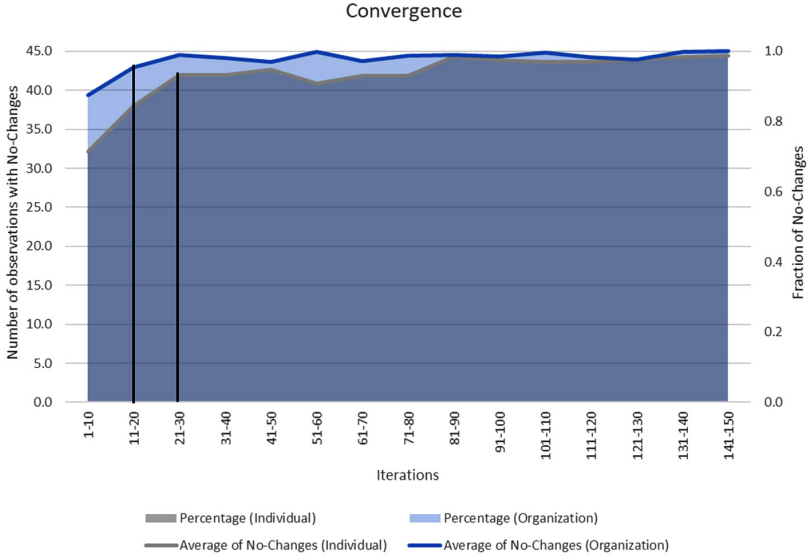
Convergence

Figure 5. Convergence in the classification using the organizational definitions
and individuals' characteristics

To associate each observation to the clusters, we calculated a score named the member-
ship degree that was obtained using the classification process data. The membership degree
was calculated for each observation and each profile, where the sum of the four scores equals
one, indicating how much an observation pertains to each type of controller. Then, the domi-
nant controller profile is determined according to the highest membership degree among
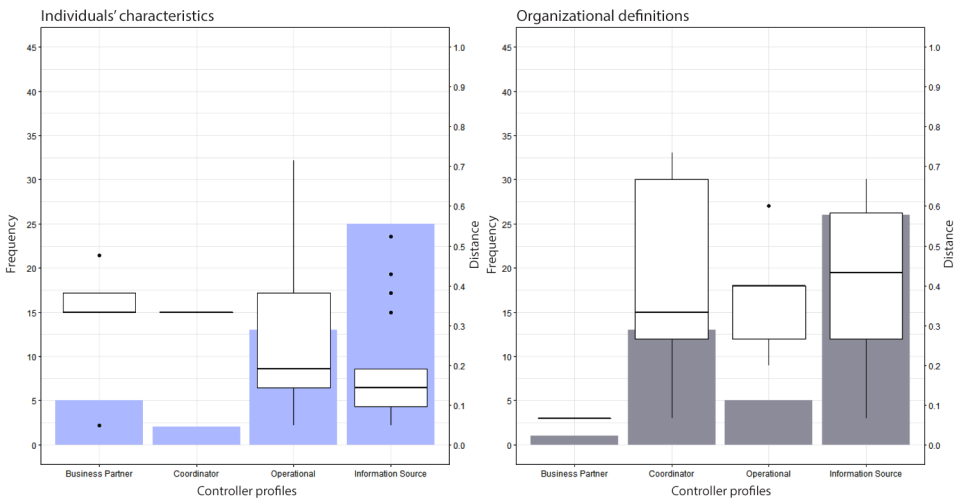the four scores. By analyzing the membership degrees, one could evaluate the differences

Figure 6. Frequency and dispersion of the distance between the first and second
most dominant profiles for each group

between the most dominant – or highest membership degree – and the second most dominant – second highest membership degree – to analyze the dominance of the profile. The analysis was performed on the classification of individuals and companies' requests as follows. First, we calculated the difference as the simple distance between the membership degrees of the two most dominant profiles and then generated a boxplot chart as a dispersion indicator. This boxplot provides information in three ways: (1) the boxes indicate the first (25th percentile – bottom line), second (50th percentile – middle line), and third (75th – top line) quartile of profile dominance distance; (2) the vertical lines represent the lowest and highest distance between two most dominant profiles using ± 1.5 IQR (interquartile range or distance between the first and third quartiles); and (3) the points show the outliers above or below the ± 1.5 IQR extremes, where only three clusters show outliers profile dominances distances. Additionally, we used the clusters' size for create a bar chart (related to frequency axes) and put together with the boxplot chart (related to distance axes). Both charts were generated using RStudio and ggplot library (see Figure 6).

4. Contrasting the controller clusters for individuals and companies

The classification processes identified a majority of the information source cluster as the most commonly dominant profile. The least dominant profiles in the classification process were the business partner in the organizational definitions, and the coordinator, in the individuals' characteristics. The results represent the dominant controller profiles that companies emphasize and that individuals present in our sample, and they allow us to reveal the matches and mismatches between companies' definitions and the hired individuals' profiles. A match is defined as a company hiring an individual who coincides with the dominant profile that the company requires, while a mismatch indicates that a company hires a person with abilities corresponding to a different profile than the set of features that the company delineates for the controller position.

The clustering process shows that matches were identified in the information source and operational groups. For the most coincident profile, similar number of observations are found in the individuals' and the organizations dataset, but less than half of the individuals and companies match. There are more individuals labeled as business partner controllers than companies that require this type of controller, whereas there are more companies in need for a coordinator controller than individuals in this group. In the case of operational controllers, more individuals present the dominant profile than companies requiring one. Figure 7 shows the classification frequencies in the groups, indicating the matched and mismatched proportions for each profile.

A one-to-one match analysis reveals that 42% of the companies and individuals from the sample match well (most of them from the *information source* controllers), and a concerning 58% do not match, i.e., companies define a controller position, but they hire a person with abilities that do not fit the profile, or individuals work for companies that appreciate skills that are different from theirs.

Table 2 further details the matches and mismatches in the sample, where the diagonal indicates the matches between companies' needs and individuals' abilities, and the cells above
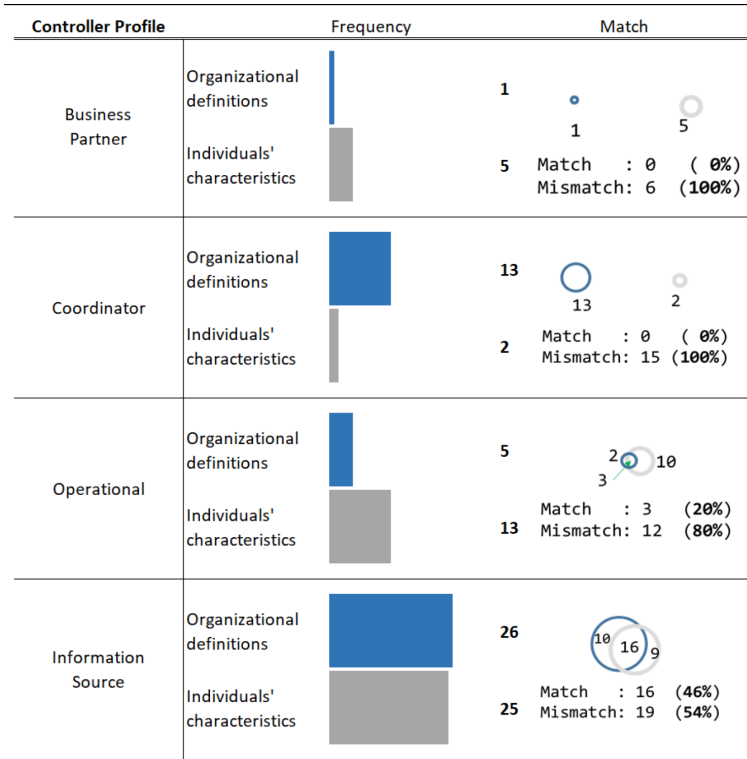
Figure 7. Classifications, matches and mismatches of controllers per type in each dataset

or below reveal mismatches. Indeed, above the diagonal, one *information source* controller is hired as *operational* controller, seven as *coordinators,* and one as *business partner*, while five *operational* controllers are contracted as *coordinators*. The values under the diagonal of the table identify that five *operational* controllers were hired as *information source*, one *coordinator* work as *information source* and one works as an *operational*, four *business partners* work as *information sources* and one *business partner* work as *coordinator.*

In addition to the classification of individuals and organizations' definitions of the role, the clustering technique also defines a stable set of variables that best describe the clusters,

Table 2. Match according to dominant profiles in each dataset

		Organizational definitions				Total
		Information Source	Operational	Coordinator	Business Partner	
Individuals' characteristics	Information Source	16	1	7	1	25
	Operational	5	3	5	0	13
	Coordinator	1	1	0	0	2
	Business Partner	4	0	1	0	5
	Total	26	5	13	1	

where the final values for the subset of variables initially set as null are particularly interesting. The years of experience as a professional and controller show that *business partners* are the most experienced and the *operational controllers* are the least experienced. Additionally, the majority of the observations in the *business partner* and *coordinator* groups have academic backgrounds in management, while the majority of the *operational controller* and *information source* groups have academic backgrounds related to process and accounting disciplines. Furthermore, the results indicate that *business partners* and *coordinators* report mainly to CEOs or company directors and actively participate in the formulation of their company's strategy, whereas *operational* and *information source* controllers report to the CFO, indirectly participate in the strategy formulation process, and do not actively participate or influence it.

5. Discussion

Identifying the right person for the job is critical for the well-functioning of organizations. This match is especially critical at the C-Level where high-impact decisions are made. In the areas of controlling and managerial accounting, the discussion is interesting given the rapid evolution of the areas in the recent decades. Matching a position with the right personal and technical abilities facilitates the planning, monitoring, controlling and performance processes according to the corporate vision to achieve with efficiency the alignment and strategy deployment. In contrast, a deficient definition of the role or filling the role with the wrong over/underqualified person will likely hinder the controlling process, generating frustration and underperformance in companies and individuals.

The results are consistent with the literature about the mismatches between the individuals' abilities and companies' approach to controlling (Rieg, 2018). In a few cases, companies hired controllers with strategic and proactive abilities and skills, but then assigned them reactive and operational control responsibilities. Such cases could be regarded as overqualified professionals in the role or underutilized skills by companies. On the other hand, more frequently in our sample, companies shape the role as a strategic and proactive approach to control but hire professionals with strong technical skills but insufficient managerial, communication and interpersonal abilities. The latter would not produce the expected results from the controlling process, since the proactive and strategic definitions require networking, leadership and other managerial, communication and interpersonal abilities to be successfully deployed. Additionally, the simplistic dichotomy of controller types (the *bean counter* and *business partner*) is questioned by the hybrid or intermediate profiles (Karlsson et al., 2019; Rieg, 2018).

Mismatches can be the result of different causes (Goretzki et al., 2013). One cause could be the market forces, and if we considered individuals as the supply and companies' requirements as the demand for types of controllers, our sample could match better by redistributing the professionals in the companies according to the dominant profiles' definitions. There can be market gaps if there are not enough professionals with the given abilities and skills to meet the needs of companies for that specific type. In the studied sample, this would be the case for *coordinators*, where more companies desire this type of role (13 cases), but

few individuals (2 professionals) possess its dominant characteristics. The market forces are dynamic, as the companies' approaches to control can change with the evolution of the technological, growth, maturity, legal and normative environments and a wide array of variables. Individuals can also change by shaping their professional careers and improving their abilities and skills through practice and specialization. The recruitment and selection, or the headhunting processes, can help to solve mismatches, but gaps may require the intervention of more actors, such as educational institutions, where individuals could develop the appropriate skills for the different types of controller roles in response to the market demands and requirements.

This research presents a conceptual map, which was built on the basis of previous publications, that classifies roles and individuals into four distinct types of controllers. The four types are theoretical, but companies and individuals commit to responsibilities from the different types of controllers, and they interactively use the abilities of information sources and operational controllers or business partners with coordinators, associated here with the dominant clusters.

Conclusions

The approach of companies and professionals to the controlling function has changed and evolved in the last decades and will continue to do so with the pervasiveness of digital transformations and process automation. From the organizational point of view, the controlling function became a permanent process that facilitates the compliance to norms, the deployment of a business strategy and the survival of companies that strive in an increasingly complex environment flooded with big data. Professionals with control responsibilities need to develop skills and abilities to exploit information technologies to manage the financial, managerial and cost accounting systems and to influence people's behavior and effectively communicate with different actors at all corporate levels. Many other forces can be mentioned with respect to the evolution of control as one key managerial function; however, the above can be decided by companies and individuals themselves, while others are external, and companies do not directly impact them.

Our study conceptualized the different types of controller profiles required by organizations and performed by professionals in the field. In addition, we introduced and empirically tested a conceptual framework for controller profiles. The framework was used to map a sample of controllers by their abilities and relevant personal characteristics for the job; on the other hand, the organizational emphases define a given controller profile that is mapped mainly by using the responsibilities and organizational structure for the position. The mapping was conducted by applying semisupervised clustering techniques to a sample that assigned the observations to the dominant profiles. The dominant profiles are contrasted to analyze the matches between organizational preferences and the hired professionals. The evidence shows that there are important mismatches and an operational rather than a strategic emphasis on the controlling function. The clustering also allowed us to identify the over and underqualified professionals based on the responsibilities assigned by companies, which could be one factor that explains why companies do not always reap the benefits of management control.

The results from this research have multiple theoretical and practical implications. The conceptual framework – although not prescriptive – organizes the current controller archetypes found in the literature in an aggregate manner such that companies and individuals can use it to evaluate what type of controller they need or belong to, respectively, and then adjust the role definition and career development. Additionally, scholars can use the framework to question the direction of the management control discipline and adjust their research agendas. Universities and educational institutions may analyze and eventually update their academic programs to respond to the market's needs, or decide which competences and subjects to teach in their undergraduate and graduate programs. Finally, headhunting companies and recruitment and selection processes may use this framework to better match companies and individuals. Future research avenues can be explored to study the effects of the selection of over/underqualified controllers, the actions or strategies to prevent/minimize the mismatches in the selection and recruitment of controllers, and the impacts of the controller type on the effectiveness of the controlling function.

Our results should be carefully interpreted, since they are based on an exploratory but not confirmatory approach. Additionally, the information collected in the sample is self-reported by the individuals, and a number of other market forces, such as wage level, employment rates, regulations that mandate compliance reports, maturity of the financial system and entrepreneurial development, are not included in the study. Thus, the information could be biased with respect to the strengths they claimed to have or the importance of the activities assigned by their companies for which they are responsible and accountable, which are dynamic, difficult to obtain, and depend on external market forces. Furthermore, the semisupervised algorithm needs significant computational resources in order to minimize the effect of the initial seed in the mapping process, especially when stricter convergence criteria are set. Also, as a semisupervised method, it contains some limitations of supervised and unsupervised learning algorithms, e.g., obtaining unstable results, because final classifications are affected by input dataset and setting. Even so, this is an interesting proposal to identify the actual control approaches in companies and the dominant abilities of individuals. This study aims to open new lines of research to extend the understanding of the roles of controllers and their evolution towards finding a better match between the organizational definitions and the emphases of management control with the professionals' abilities.

Author contributions

Author Contributions: Conceptualization, Ariel La Paz and Daniela Gracia; Methodology, all authors; Data Curation, Daniela Gracia and Jonathan Vásquez; Formal Analysis: all authors; Writing, all authors; Coordinator, Ariel La Paz; Validation: Daniela Gracia.

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