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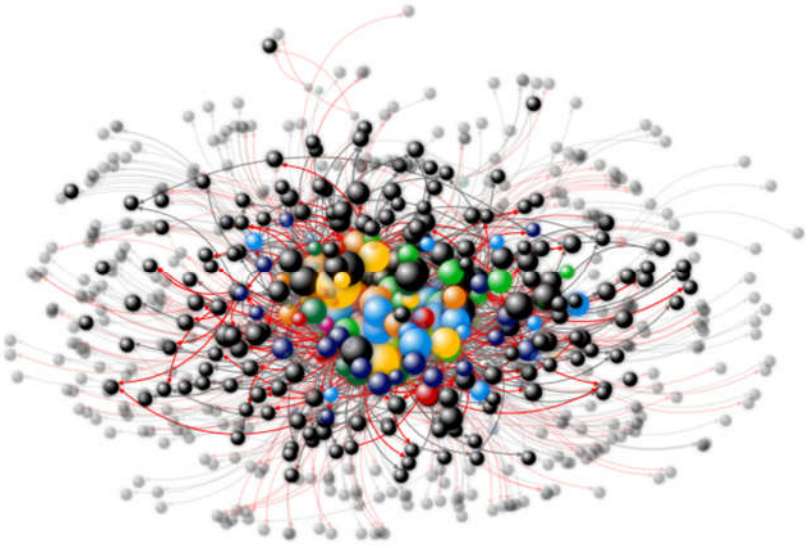
Organizational Network Analysis – Nicaragua Workforce Development System



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SYNOPSIS

Through the support of USAID / FHI360's "Workforce Connections" community of practice, LINC conducted an Organizational Network Analysis (ONA) of workforce development systems in three regions (departments) of Nicaragua from May to September 2015. The research was undertaken to better understand how various workforce development actors and functions interrelate, informing future program strategy and design efforts in support of the sector. 131 core network actors in nine functional groupings (e.g. government, vocational institutions, employment agencies, etc.) were surveyed, identifying 506 unique organizations and describing 1,248 partnerships. Overall, the workforce development network was found to be a diffuse one with an overall lack of coordination, lack of dominant actors, ease of access across functional groupings and numerous opportunities for network development. We are encouraged to see a significant degree of resilience in the network, with no single actor or groupings of them seemingly capable of network disruption.

Findings indicate that workforce development networks organized around specific sectors (or sub-networks) are significantly stronger than those of the overall network, promising for future workforce development efforts that catalyze pivotal actor groups specifically identified in this research around sectors such as construction and tourism. There appears to be ample opportunity for hub-based workforce development strategies, in addition to efforts that include incubation for specific small actor groups, strengthened communities of practice, and more coordination among actors that share similar functions within the system. In relation to these functions, it is apparent that labor market intermediaries (i.e., employment agencies, labor / trade unions, business associations) are a high potential actor group, capable of connecting a number of groups with surprisingly weak ties such as vocational training institutions and employers. We found government and external stakeholders (e.g. donors, foundations) to be highly engaged in the network, introducing questions as to the extent to which they directly intervene in the system. NGOs are another group of interest, entrepreneurial and eager partners that are plentiful in our sample, but most likely lacking in the requisite influence and convening power to effectively lead particular network development activities.

For specific comments or questions on this report, please contact Mr. Rich Fromer, Managing Director of LINC, at rfromer@linclocal.org

1. INTRODUCTION

From May to September 2015, LINC conducted an Organizational Network Analysis of workforce development (WfD) systems in three departments (administrative government territories) of Nicaragua: Managua, Leon and Matagalpa. The activity was funded as a learning grant through the support of USAID / FHI-360's "Workforce Connections" community of practice. This pioneering application of social network analysis was conducted to inform systems-based learning prior to initiating workforce development support activities, enabling donors, program implementers and multiple actors in the system to make more informed decisions on programming funds and structuring interventions in this space. As thus, this report includes programming recommendations, in addition to observations on networks, specific actors, and highlights what we can learn about workforce development systems via application of this tool.

Social Network Analysis (SNA) is a relatively new entrant to the international development space, an approach that has, to date, been most commonly associated with information technology. The technique analyzes actors at multiple levels of a given system, with a focus on their relations and interconnectedness. Analysis generally focuses on informational (as distinct from material or transactional) exchange, particularly the speed at which information diffuses, enabling enhanced coordination, resource sharing, and by extension, opportunity. Utilizing this method of thinking about social systems, the researcher is able to gain fuller understanding of the composition of a particular system / network, key actors that reside within it, and potential pathways and obstacles to change. As a result, development resources can be more effectively targeted to pivotal actors and opportunities, and generally more context-aware of potential impacts that they may have on the system prior to initiating activities.

> *An actor's position in a network determines in part the constraints and opportunities that s/he will encounter, and therefore identifying that position is important for predicting actor outcomes such as performance, behavior or beliefs.*
>
> -Borgatti, "Analyzing Social Networks" (2013)

Organizational Network Analysis (ONA), a sub-set of SNA, focuses on the organizational level. In the context of this research, organizations include a wide array of formal actors, including NGOs, government, educational institutions, and others. Multiple attributes are assigned to these organizational actors, allowing us to disaggregate respondents by a number of characteristics, including their functional role within the network, areas of operation, sectoral affiliation, etc. Each organizational actor is referred to as a "node", and the relationships / ties between them called "edges." Measurement of edges can take many forms. In the frame of this research, we included relationship type, strength, direction, and frequency. In addition to actual ties, the research further assessed desired ties. Analysis of ONA results can be done at both the whole network and individual organization (i.e. "ego") level. In this research we have opted to assess both the whole network and individual actors utilizing the same data set.

2. THE CONTEXT OF WORKFORCE DEVELOPMENT IN NICARAGUA

Overview of Employment and Economy in Nicaragua: Nicaragua is the country with the most land area in Central America, but has the smallest, and very unevenly distributed population. The percentage of households in poverty remains high, despite a steady decline over recent years (from 44.7% in 2009 down to 40.5% in 2013).[1] Officially, unemployment rates are relatively low (estimated at 6%), but underemployment is a constant

[1] Dinámicas de la Pobreza en Nicaragua 2009-2013 (Fundación Internacional para el Desafío Económico Global)

challenge (estimated at 50%), and most Nicaragua employment is generated by the informal sector (66% of employment is generated by microenterprises of 1-5 people).[2]

Over 60% of the Nicaraguan population is under 30 years of age, and 30% (1.8 million) are between 15 and 30 years old.[3] This youth bulge combined with low and dropping population growth (1.2%) due to the decline in fertility rates, have created a demographic dividend for Nicaragua, as the working age population continues to grow compared to the dependent population. This represents a 20-30 year period of opportunity for significant economic growth and increased employment and productivity for the country overall.

In 2012, agriculture and fishing employed approximately 32% of the workforce, services employed 29%, trade employed 19% and manufacturing employed 15%. In the past 50 years, agriculture has been decreasing significantly as an employer (60% in 1963, 40% in 1990), most often replaced by services and trade in the informal sector (14% and 7% in 1963 respectively, 20% and 17% in 1990). Manufacturing has more recently shown a clear increase in employment (from 10% in 1995 to 15% in 2012).[4]

Labor Market Analyses and Development Efforts: There has not been any formal study conducted to understand current or future labor force demand. In January 2015, the Higher Council for Private Enterprise (COSEP, Spanish acronym), the International Labor Organization (ILO), and the Nicaraguan Foundation for Economic and Social Development (FUNIDES, Spanish acronym) began a survey of 2,400 companies that will include labor demand and projections. The study will provide information by size of the companies, formal and informal businesses, 17 economic sectors, and across all regions of the country.

Without this formal study, it is difficult to estimate specific needs for skills and sector demand, but several sectors are clearly high priorities. At the national level, the government and private sector are expecting increased employment in Infrastructure, Dairy, Renewable Energy, and Food Processing. Different regions of the country have more specific priority growth sectors. There are also needs in communities throughout the country for youth with high-quality skills in trades such as carpenters, electricians, plumbers, and auto mechanics.[5]

Many international donors are active in workforce development in Nicaragua, and there is a donor coordination group for technical and vocational training that has been quite active in sharing information on activities and results. Most of these donors are supporting the governmental national Technical Institute (INATEC, Spanish acronym) in their role as regulator or providing direct support to INATEC-run TVET centers.

Technical Education: The Nicaraguan Education System is managed through sub-systems, the three most relevant of which are: Basic and Secondary Education (managed by Ministry of Education, MINED); Technical Education (managed by the National Technical Institute, INATEC); Higher Education (managed by the National Council of Universities, CNU). These three sub-systems create a path for students to follow from pre-school through university and post-graduate education. There is a clear need to increase coordination among the sub-systems, and the Government of Nicaragua (GoN) has acknowledged this as a priority in their Strategic Plan for Education and in the National Strategy for Technical Education.

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[2] INIDE Encuesta de Hogares, Arturo Acevedo.

[3] INIDE, Estimaciones y Proyecciones de Poblacion Nacional, Departamental y Municipal, 2007.

[4] INIDE Encuesta de Hogares, Arturo Acevedo.

[5] Estudio de Base para la Formulación de una Estrategia de Intervención para la Educación de Jóvenes y Adultos con Enfoque Técnico Ocupacional. Octubre 2011. UE, MINED, OEI (pp 37-40, 55).

In technical and vocational education and training (TVET) centers, the vast majority of those enrolled (82%) only take individual short courses with only a minority studying a "career" set of courses that could provide them with a technical education diploma. There are more students enrolled in universities, and a generally acknowledged preference by students and their families for a university education. The active workforce also has a relative lack of technical diploma graduates (3.6% of the workforce has a technical diploma, while 14% have a university degree).[6]

TVET Centers: INATEC runs 43 technical training centers throughout the country, and certifies / regulates approximately 250 private centers nation-wide. Many of the private centers are for-profit companies that charge for training services. Those tend to focus on English language skills, computer skills, secretarial skills, and accounting. Private centers run by NGOs generally focus on at-risk youth or other vulnerable populations, and usually provide full scholarships to all students, with funding from corporate, foundation, or bi-lateral donors.

Some NGO-run private centers offer courses targeting specific highly technical careers such as industrial equipment maintenance, refrigeration, carpentry and auto-mechanic. Others offer shorter courses targeted to specific skills for jobs (e.g., cashier, waiter, computer skills), or for entrepreneurial ventures. Most offer life skills as well. The private TVET centers themselves acknowledge that they do not have strong connections to the private sector, are missing important information on the labor market, and lack the ability to update their training materials and equipment to the state-of-the-art equipment in use by employers.

Private Sector Efforts, Intermediaries: Many of the medium and large enterprises in Nicaragua are interested in improving labor market training and supply, but the majority of those are conducting their own individual efforts for their own employees. Several, recognizing the lack of technical skills in the workplace, have invested in more significant training facilities and activities, or support private TVET institutions directly.

Nicaragua also has a large number of business associations, some based on sectors or geographies, and others with a broader focus. Some of those associations, such as the American Chamber of Commerce (AmCham) and the National Chamber of Industry (CADIN, Spanish acronym), are also beginning to invest in technical training for the wider workforce, in an effort to increase labor market supply for their members.

There is a growing market for other employment agency intermediaries, including recruiting firms, matchmaking companies, and full-service human resources management firms. At the moment, these tend to focus more on high-level employees in management positions, leaving employers and job seekers for more technical positions without this type of intermediary support.

3. RESEARCH DESIGN

3.1 Learning Objectives

As a relatively new analytical approach in the international development sector, and the first such application of which we are aware to workforce development, learning objectives of our research are multiple. They can be categorized as follows:

[6] INATEC, INIDE Encuesta de Hogares.

Objective 1 - Address critical program design information needs: At the outset of this research, weak collaboration within Nicaragua's Workforce Development (WfD) system was apparent, but evidence was anecdotal with little information about specific actors. This research therefore seeks to identify actors and their position in the network, and understand network structure and inter-relationships between actors. Recommendations for future programming are derived from these observations, augmented by our qualitative knowledge of the existing system.

Objective 2 - Assess specific functions within the WfD system: We have drawn on research from the World Bank's SABER Initiative, indicating that enhanced information, coordination and relationships create a better match between skills supply and skills demand in WfD systems, thus more jobs and productivity (see Section 3.4). Our research assigns attributes to actors based on their functional role within the WfD system. Coordination between and among these functional categories is assessed and inferences drawn related to the overall functioning of the WfD system as a whole.

Objective 3 - Provide comparative insight: The research makes observations on different network and sub-network types. WfD network types are differentiated by geography, sector, and working groups.

3.2 Network Definition

A critical design phase activity for ONA is carefully defining the network based on a single common goal among actors in the network, and an agreed boundary of the network. The ONA methodology seeks to survey all actors meeting network membership criteria so it the network definition and boundary are important to clarify before beginning the survey process. For this Workforce Development ONA in Nicaragua, the network was defined to consist of actors that:

- Operate (have activities, provide services, support efforts of others) within relevant geographic boundaries of the network which were the Departments of Managua, Leon, and/or Matagalpa;
- Strive to increase quality or quantity of jobs and/or labor supply (not only for the purposes of their own organization, but broader labor force development);
- Are formally established under the legal framework of Nicaragua (not an informal group such as a roundtable, community of practice, or an individual);
- Do not simply employ job-seekers (no employers that are just hiring, must support improvements to the labor market beyond their own employees); and
- Are not simply job seekers.

3.3 Utility and Limitations of the Research

To our knowledge, the ONA approach was being applied for the first time to any sector in Nicaragua, and potentially to WfD systems in the international development sector overall. Additional to this, the research was conducted as a single "snapshot in time", much like a baseline, not benefitting from any historical precedents or existing data sets to obtain longitudinal data against. Further, the ONA methodology analyzes relations between actors, rather than the nature or perceptions of actors themselves. All of the above impact on both the utility and limitations of this research to inform future application, as outlined below.

First-time application to WfD systems: Our lack of an existing body of research that correlates network structure to broader WfD systems limits the extent to which we can reliably draw inferences from the data. To the extent possible, we have mitigated this limitation by drawing upon established research on WfD systems dynamics, analyzing sub-networks and potential for change, and infusing the research with our strong qualitative knowledge of WfD in Nicaragua.

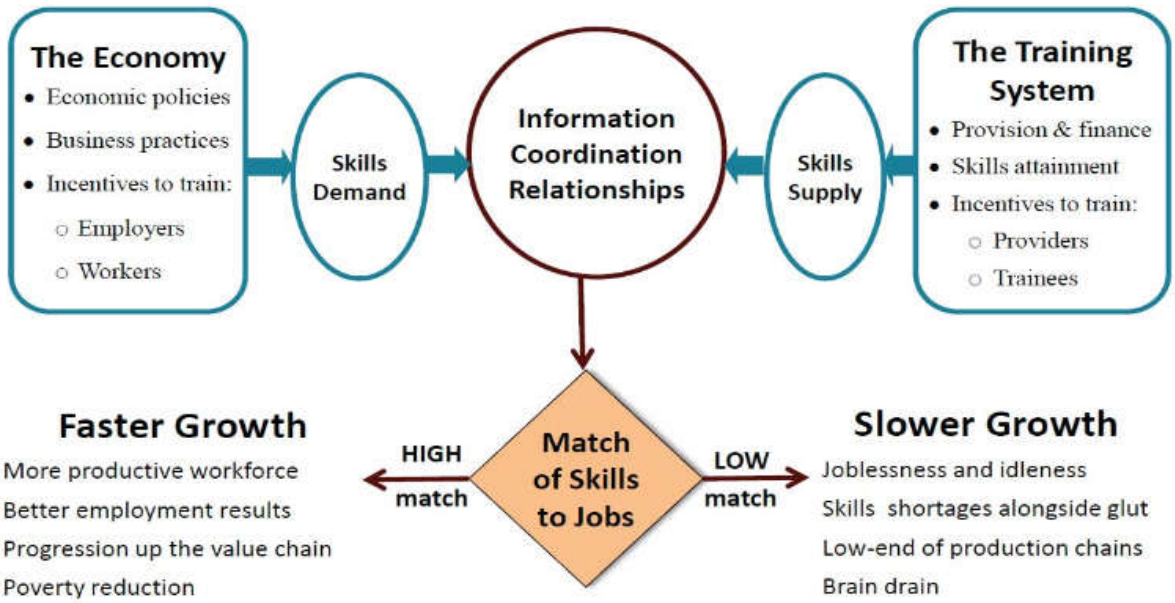
Baseline / Snapshot in Time: By virtue of the fact that we lack historical data and are conducting this analysis for the first time on Nicaragua's WfD system, only static data has been collected. We have infused this static data with our in-depth qualitative knowledge of this system in particular in order to derive our programming recommendations and anticipate future network change. This has obvious utility for program design, however, we will not be able to see actual network change until a follow-up ONA is conducted with the same actors.

Relations between actors: By definition, social network analysis analyzes relations between actors, not the nature or perceptions of actors themselves. We have taken several steps to inform our knowledge here, including consultations at the research design stage, the input of key informants, and again, our own qualitative knowledge.

3.4 Analysis of Groups / WfD Network Functions

Organizational Network Analysis (ONA) focuses on relationships between actors in multiple levels of complex systems. In the case of Nicaragua, we have categorized surveyed actors according to their functional role within the WfD system. This enables us to assess the extent to which core functions within the WfD system are being fulfilled, and by extension, the degree to which they are / are not efficiently matching labor supply and demand.

To frame-up the analytical approach, it's helpful to reference the World Bank's Systems Approach for Better Education Results (SABER), which includes a helpful discussion of why information, coordination, and relationships matter in WfD systems. Essentially, the idea here is that alignment of skills demand and skills supply is central to a well-functioning WfD system. In systems where the match is good, significant benefits can accrue in the form of a dynamic and productive workforce, and higher rates of employment and labor utilization.[7]



[7] World Bank, Systems Approach for Better Education Results. SABER Working Paper Series: "What Matters for Workforce Development: A Framework and Tool for Analysis" (No 6, April 2013), pp. 10-15.

In the case of the Nicaragua ONA, we identified the following WfD systems functions and aligned them with RTI International's "Workforce Development Ecosystem Assessment" tool. At the survey stage, all respondents were asked to categorize their organizations into one of the following functional groupings, and group attributes were coded into the survey database[8]:

	Private Enterprise / Cooperative (Employer)		Job Placement / Employment Agency
	Educational Institutions (High School, University)		Labor / Trade / Workers Rights Organization (Union)
	Vocational Training or Technical School		NGO
	Government Institution (Local, Central)		External Stakeholder (Foundation, Donor, Research Org)
	Business Association		

4. SURVEY METHOD

4.1 Consultations, Data Collection and Analysis

Advance consultations: Consultation events were conducted in both Managua and Washington DC during the research design phase of this activity, engaging over 60 stakeholders including NGOs, donors, research organizations, representatives of government and other organizations involved in workforce development. These consultations helped to refine the research plan according to expressed learning objectives, structure and test the questionnaire, and develop a preliminary "first-wave" list of organizations to be included in the survey.

Snowball approach to data collection: The survey was conducted utilizing a snowball approach, a common practice when, as in most cases, there is incomplete knowledge of the membership of the network prior to initiating the survey. Utilizing this approach, a list of organizations for each department was developed on the basis of pre-survey consultations. Those organizations were surveyed in the "first wave", asking respondents to indicate their relationships with other organizations. In subsequent waves, those other organizations that were effectively nominated for survey participation were vetted for their compliance with the network definition, and subsequently surveyed. The network boundary was reached when there were no additional qualifying network members named.

Enumeration technique: Before conducting any interviews, enumerators were trained on ONA, the questionnaire itself, and probing interview techniques. This included conducting guided practice interviews with real network actors. Before conducting each interview, the respondent organization was asked four questions about their organization to ensure that the organization was a member of the network, and the enumerator confirmed that the person being interviewed had knowledge of the organization's relationships. The interviews were conducted using a questionnaire in Spanish that included 10 questions about the organization being interviewed, followed by 4 network questions regarding the type and strength of existing and desired

[8] Note that some organizations felt that they might fit into more than one category. In those cases, they were asked to indicate which was the *primary* role that their organization plays in the network.

relationships (see Annex B for the full questionnaire in English). Respondents were guided through the questionnaire by enumerators and probed for complete responses to the network questions.

Field data collection and verification: The project employed three enumerators and one supervisor, as well as an in-country project coordinator to monitor progress and provide additional support and verification. Over the course of nine weeks from May 25 to July 31, 2015, the enumerators scheduled and conducted interviews. Scheduling was conducted by email and phone; interviews were conducted in person or on the phone, depending on the respondent's availability and preference. Enumerators were based in Managua and conducted most interviews there, but also scheduled two weeks in each of the other network departments, Leon and Matagalpa. The supervisor and the project coordinator each conducted site visits to monitor progress and ensure accurate data input. Verification calls were conducted with 12% of all interviewed actors to ensure data integrity.

Data Management and Analysis: Data entry and analysis was conducted in NodeXL, an open-source network analysis software fully integrated into Excel and customized by LINC to the requirements of this research. Field survey results were compiled on an ongoing basis by the field research team. Ensuring consistent naming conventions for actors identified in the survey required ongoing management and coordination among research team members. Data was cleaned and analyzed, with all metrics and map reports presented in this report generated in NodeXL.

4.2 Issued Encountered

Willingness of respondents to participate: In several instances our field survey team encountered an unwillingness of potential respondents that had been nominated by other actors utilizing the snowball sampling approach to participate in the survey. This was not unexpected for the snowball sampling approach, but more frequent than we would have liked. For this reason, data has been presented below to include both all those organizations that directly participated in the survey (n=89, 62, 65, 133) and those that had participated and been named in the survey (n=417, 323, 325, 506). We have however dedicated the majority of our analysis to those organizations that fully participated in the survey (n=89, 62, 65, 133), as these reflect the population for which we have complete data and attributes. We believe that the overall effect is that governmental institutions are under-represented in the sample, whereas more willing respondents, such as external stakeholders and NGOs, may be over-represented.

Recall error: A common challenge when conducting social network analysis, recall error is the tendency for survey respondents to not remember and name all organizations with which they are connected. Utilizing roster-based approaches, impossible without perfect advanced knowledge of network members, is the only way to substantially reduce recall error. The survey team took a number of measures to reduce recall error. This included division of network / relationship questions into more manageable sub-queries, and prompting enumeration techniques.

Inter-regional activities: The survey was conducted in three departments, Managua, Leon, and Matagalpa. We encountered a higher than expected percentage of organizations that were operating in more than one of these target geographies. Additionally, results found very similar network dynamics in each of these locations. For this reason, we opted to concentrate the bulk of our analysis on the combined network data (all three departments taken together), providing us with a more robust sample and not artificially segmenting the network. This report has thus been organized to provide consolidated network data and observations first (Section 5), then point out meaningful differences between the departments with accompanying maps for each of the three locations (Sections 6-8). Further, a list of all surveyed organizations and basic metrics for them has been presented in Annex A.

Surveying Private Enterprises / Cooperatives (Employers): This group of actors represented a particular sampling challenge, one which was addressed at the research design phase. Utilizing the snowball sampling approach, this unique set of actors within the context of workforce systems was a potentially unlimited one, necessitating careful designation of the network boundary for inclusion of employers in the survey. That is to say that, as the focus of the research was the WfD network, potentially any employer could be included in a broad definition on the basis that they hire workers. To resolve this issue, employers were only included in the network if they were specifically involved in workforce development activities - beyond training or support to their own employees. The workforce development activities qualifying for network membership included:

- Training / education / capacity development (theoretical and practical) specifically to improve the employment situation for employed and unemployed individuals (but not only your own employees)
- Job placement services or support to find or improve employment (but not only for your own staff)
- Facilitating entrepreneurship and support to new entrepreneurs
- Financial or technical support for any of the above activities

4.3 Maps and Metrics

Maps presented throughout this report are color-coded on the basis of actor group and correspondingly labeled (see Section 3.4). Node size expresses the relative number of in-degree ties of each actor. Strength of ties were measured but not expressed on maps for the sake of readability. Categories and definitions for metrics used throughout this report are included in the table below.

Metric	Explanation
Basic Network Features	
Size (# nodes)	The number of actors/organizations in a network. Whole number.
Ties (# of edges)	Number of reported connections among actors. In-degree ties are ties into a given node; out-degree ties are ties out of a given node. Whole number.
Components	Number of disconnected subgroups or fragments within a network. Whole number
General Metrics of Network Cohesion	
Density	Describes the overall connectivity of a network; based on the proportion of actual to possible ties, key to calibrating scale of interventions. Percentage.
Betweenness Centrality	The number of times a node acts as a bridge along the shortest path between two other nodes. Applied to single (ego) actors and expressed on whole network level as averages among all egos.
Closeness Centrality	Distance between pairs of nodes in a single component. Applied to single (ego) actors and expressed on whole network level as averages among all egos.
Distances Between Actors	
Diameter (maximum geodesic distance)	The maximum number of relations (steps/degrees) separating one actor from another. Whole number.
Average distance (geodesic)	The average number of relations (steps) separating actors. Whole number.
Strength and Clustering	
Reciprocity	Extent to which directional relationships are balanced or unbalanced. Average figures refer to node pairs; Median figures refer to reported relationships. Percentage.
Clustering coefficient	The degree to which actors cluster in small groups. Percentage.
Strength	Refers to the strength of a given ego (individual) actor's relationships. Calculated on a 1 (minimum) to 45 (maximum) point scale based on relationship type and perception.
Potential for Change	
# of Actors	Number of Actors reporting a desired partnership. Whole number.
Desired ties	Number of desired ties. Whole number.
Potential Density	Projected Density if desired partnerships are developed. Percentage.

5. WHOLE NETWORK FINDINGS

ONA findings have been identified for the whole network across all three target geographies (Section 5), and for each regional network: Managua (Section 6), Leon (Section 7) and Matagalpa (Section 8). The whole network analysis produced meaningful insights into the roles of various labor market functions (section 5.2), comparisons of specific sub-networks of interest (section 5.3), and the structure of ego-networks for specific high-interest actors (section 5.4).

In general, the analysis indicates that the workforce development network in Nicaragua is relatively diffuse (low network density, meaning a low total number of connections relative to the total possible connections), and clustered around smaller groups (higher density subsets of actors). The three regional networks had very similar structures to the overall network, and many actors are present in multiple networks. The analysis also showed that, based on actors' currently desired network relationships, the network structure, density, distance and reciprocity of relationships may not change significantly without outside intervention.

In analyzing the network based on labor market functions, it is clear that external stakeholders such as donor agencies are very active and influential in the network. Government institutions exhibited the highest within-group density. Three key labor market function groups had relatively few relationships outside of their own group: vocational institutions, employment agencies, and labor/trade unions.

Workforce development sub-networks organized around specific economic sectors (such as tourism and construction) are significantly denser than those of the overall network. This is an insight that can have a wider reach and indicate potential for change given that government entities and some workforce development programs are organizing their efforts by sector. There also appears to be ample opportunity for hub-based workforce development strategies targeting support to the whole network through influential and central individual actors, incubation of some specific small actor groups, and enhanced coordination within groups. See Section 9 for related conclusions and recommendations.

5.1 Network Overview

To describe the workforce development network within Nicaragua, 131 organizational representatives from three departments reported on their working relationships with other organizations. About 32% were active in Managua only, 16% were active in Matagalpa only, and 14% were active in Leon only. The remaining respondents were active in multiple locations: 30% were active in all three departments and 8% were active in two of the three. The network is comprised of all nine functional types of organizations designated by the research. Of those who responded, NGOs were most common (24%), followed by external stakeholders (19%), and vocational institutions (16%). Labor or trade unions (2%), employment agencies (5%), and educational institutions (5%) were less common among respondents.

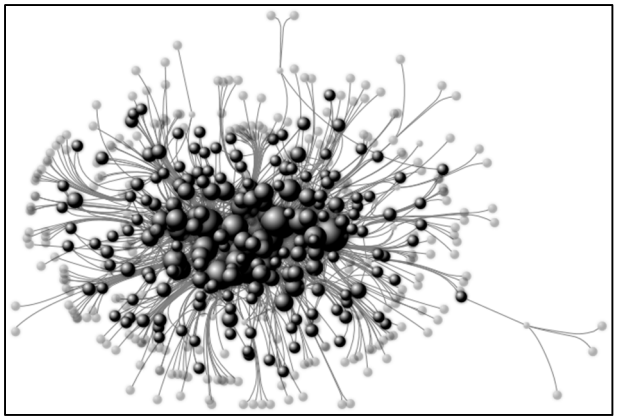


Figure 1 - Combined Entire Network (n=506)

Their responses identified a total of 506 unique organizations. Together, responding organizations described 1,248 partnerships with other workforce development actors, creating a rather sparsely connected network (density = .0049) where less than 1% of all possible partnerships were reported (see Figure 1, Table 1). The organizations in this network tend to be quite distant (in terms of working relationships) – the average

distance among organizations suggests that organizations are about four steps away from any other given organization in the network, and at most, eight steps.

Overall, strong reciprocal relationships among workforce development organizations were not very common. Only 11.2% of all reported relationships (6% of all potential organizational pairs) were reciprocated. However, organizational relationships may form clusters within the sector – the clustering coefficient (0.049), although relatively low, is much higher than the network's density suggesting that although the larger network is sparse, organizations are likely embedded within smaller groups with slightly higher connectedness (an average density of these neighborhoods = 5%). Analyzing by group, we find that closeness (average distance) is highest among NGOs (3.103), external stakeholders (2.059), and business associations (1.908).

Because not all organizations within this population of workforce development organizations responded to the survey, these network metrics are likely an underestimate of the overall connectivity and strength of the larger network. However, while these 131 actors represent 26% of the network, their relationships with one another constitute 45% of all reported ties. Further, of all the organizations that were named by survey respondents indicating desired ties, only 2 organizations among the top 20 were not surveyed as a part of our sample. On the basis of this, we can reasonably conclude that the surveyed population of actors play a prominent role within, and are representative of, the workforce development network.

Table 1 - Network Data Master Table

Network Phenomena	Managua		Leon		Matagalpa		Combined Network	
	Entire Network	Surveyed Actors	Entire Network	Surveyed Actors	Entire Network	Surveyed Actors	Entire Network	Surveyed Actors
Basic Network Features								
Size	417	89	323	62	325	65	506	131
Ties	953	406	609	184	679	214	1,248	566
Components	1	1	1	1	1	1	1	1
Network Cohesion								
Density	0.005494	0.05184	0.005855	0.04865	0.006448	0.05144	0.004884	0.03324
Betweenness Centrality	1143.21	127.30	890.53	104.55	864.69	100.06	1384.44	207.48
Closeness Centrality	0.001	0.005	0.001	0.006	0.001	0.006	0.001	0.003
Distance between Actors								
Diameter	8	5	8	6	8	5	8	5
Average Distance	3.739	2.419	3.754	2.670	3.658	2.524	3.734	2.5762
Strength and Clustering								
Reciprocity (Av / Med)	0.06126 0.11542	0.17003 0.29064	.04460 .08539	0.1646 0.2826	0.0398 0.0766	0.1383 0.2430	0.0594 0.1122	0.1411 0.2473
Clustering Coefficient	0.042	0.159	0.044	0.114	0.063	0.162	0.049	0.137
Potential for Change								
# of Actors	N/A	N/A	N/A	N/A	N/A	N/A	N/A	133
Desired ties	N/A	N/A	N/A	N/A	N/A	N/A	N/A	732
Potential Density	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.04170

Network Core – Survey Respondents: Within the network of survey respondents, 566 relationships were reported. Compared to the larger network, these relationships created a slightly more densely connected

network (0.03324), where 3% of all possible partnerships were reported (Figure 1). Within the network core, organizations are an average of 2.6 steps away from any other organization, and at most, five steps suggesting that this core is more tightly connected than the larger network.

Strong relationships are slightly more common among survey respondents. About 25% of all reported relationships (14% of all pairs) were reciprocated. The clustering coefficient (14%) is also much higher within the core. These metrics suggest that connectivity is somewhat stronger among network respondents.

Variations in Workforce Development Networks: Managua, Leon and Matagalpa: Generally, the networks in each of the three departments mirror the general network structures of the larger network, and activities of single organizations in many cases span multiple regions surveyed. It is for this reason that we have opted to base the majority of our analysis on this whole network, including all three locations together in our dataset. The workforce development network was the largest in Managua, and comprised of 417 organizations. The networks in Leon (323 organizations) and Matagalpa (325 organizations) were somewhat smaller than Managua. Network density was comparably sparse, and distance was about the same across all three locations. Accommodating for single organizations working in multiple locations, there were a total of 506 unique organizations in the entire network across all geographies.

Strong reciprocated partnerships were more common in Managua (11.5% of all relationships) than in Leon (8.5%) or Matagalpa (7.7%). Specifically among survey respondents, the frequency of reciprocated ties was even higher: 29% in Managua, 28% in Leon, and 24% in Matagalpa. However partnerships were more clustered in Matagalpa (average neighborhood density = 6.3%), than Leon (4.4%), or Managua (4.2%). These results suggest that although these three departments are unique in terms of setting, the networks are structured similarly. Although there is a robust set of workforce development actors that span all three locations, partnerships are not very common, and coordination of efforts might be limited.

Potential for Change: To demonstrate this network's potential to grow, we asked respondents to provide information on partnerships they are interested in forming in the future. Respondents reported on 166 total desired partnerships (1.3 partnerships on average per organization). If all 166 partnerships were formed, the network of respondents would only grow slightly more dense (from 3.3% to 4.2%), and closer (the diameter declines from 5 to 4 steps). The estimated reciprocity also declines (from 14% to 11% of ties) suggesting that these desired relationships are with new (instead of existing) partners. Notably, no respondents reported a desired relationship with labor/trade unions. Thus, these data suggest that even if WFD organizations form new partnerships successfully, the structure of the network may not change substantially. Additional intervention might be necessary to create denser linkages.

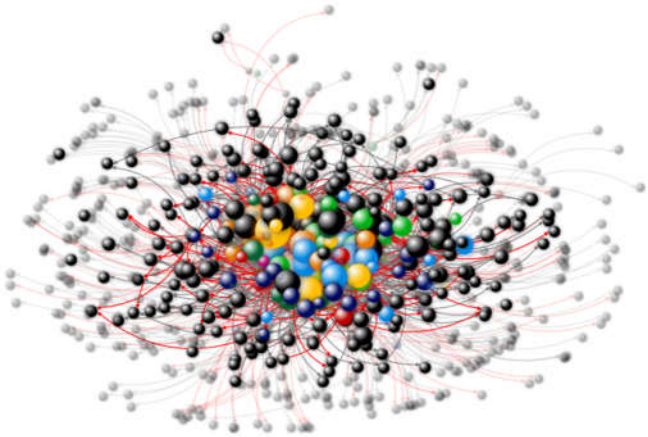
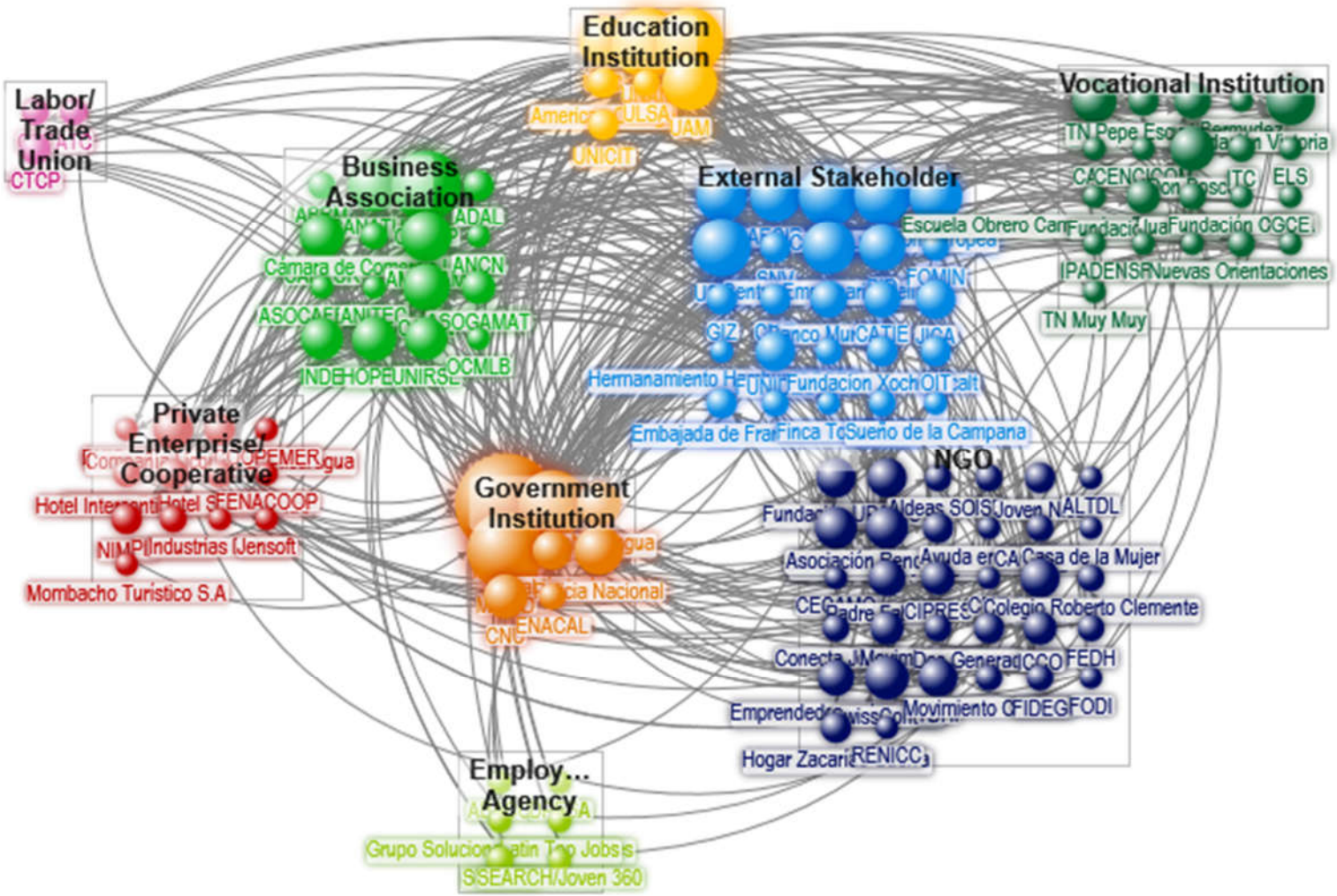


Figure 2 - Actual (grey) vs. Potential (red) Linkages

Figure 3 – Network Core Map (n=131)



5.2 Network by Labor Market Functions

As outlined in Section 3.4, our research investigates the extent to which labor market functions are coordinating across the network, effectively matching labor supply with demand. To examine coordination among and across a variety of workforce development functions, we examined relationships within and across each of the nine types of organizations surveyed.[9]

Within WfD functional groups (intragroup)*:* Partnership may be most common external stakeholders (primarily composed of donors and foundations) with 48 overall partnerships indicated within their group. The next closest were NGOs (31) and business associations (22). Nonetheless, the network of government institutions had the highest within-group density (12.5%), followed by business associations (9.2%) external stakeholders (8%), NGOs (3.1%), educational institutions (2.4%), vocational institutions (0.7%), and private enterprise (0.5%). No relationships were reported within the respective networks of key intermediary actor groups, employment agencies and labor/trade unions, suggesting possible opportunities for network development.

For those within-group relationships that did exist, they were frequently reciprocated, indicating strong partnerships. Reciprocated relationships were most frequent among external stakeholders (42%), followed by NGOs (32%), government institutions (29%), and business associations (27%). No ties were reciprocated among private enterprise, educational institutions, vocational institutions, employment agencies, or labor/trade unions. These results suggest that organizational networks within WFD sectors are fairly sparse, and similar to the larger network. However, there is some variation across WFD functions, with perhaps stronger coordination among business associations, external stakeholders, government and NGOs compared to other WfD functional groupings.

Across WfD functional groups (intergroup): Workforce development organizations also work across network groups (see Figure 6). Educational institutions, private enterprise, government institutions, NGOs, business associations, and external stakeholders reported frequent intergroup relationships that span all eight other types of organizations. Employment agencies have modest ties to private enterprises / cooperatives, and to a lesser extent, business associations. Their ties to education, vocational institutions, NGOs and labor / trade unions are very weak, or non-existent. External stakeholders are heavily networked with business associations and government. They also have a healthy number of connections with vocational and educational institutions, Unions and NGOs.

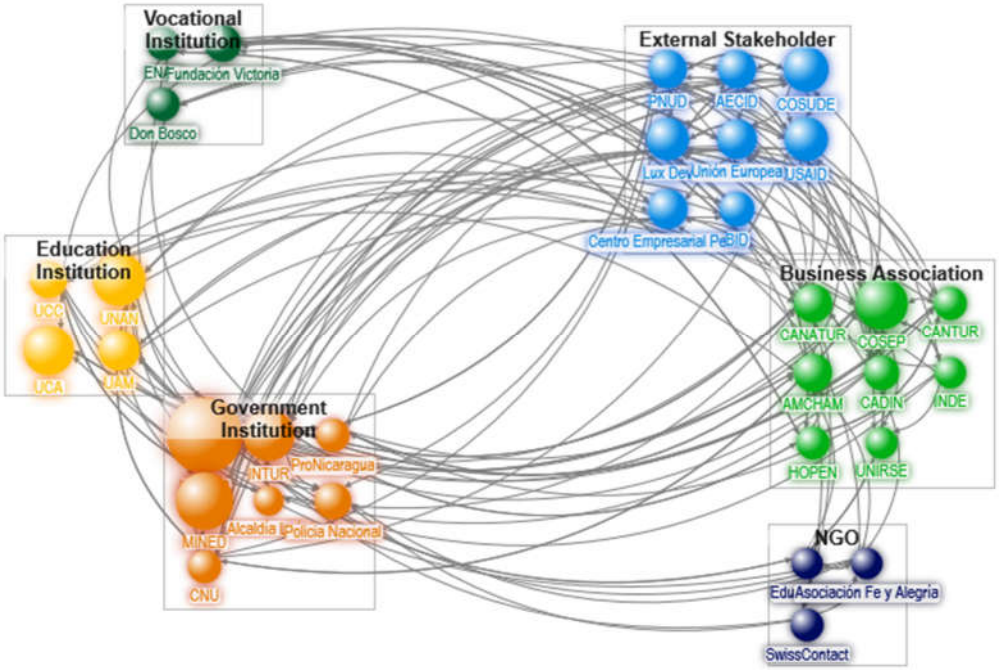
Among the fewest intergroup relationships were reported by labor/trade unions, vocational institutions and employment agencies (connected to 6 other groups). This suggests that they may not be as active as other types of agencies in coordinating workforce development efforts. However, it should be noted that there were a limited number of unions (n=3) and employment agencies (n=6) represented in this study. Nonetheless, vocational institutions (n=21) did have quite strong representation in the sample and still appeared weak in this area.

Although all workforce development functions appear to be reasonably well partnered with other group actors in the network, intergroup relationships may vary by organization. That is, some organizations may take more of a leading role in collaborating across sectors. We used a series of network visualization techniques that reduce

[9] Note that INATEC, the government regulator for vocational training, is classified as a Government Institution, while the individual TVET centers they run were surveyed and reported separately, and classified as Vocation Training Institutions.

the network down to a set of key organizations that are most active. For instance, the network was reduced to only include organizations that were nominated by at least six other partners (in-degree), representing a fairly high level of collaborative activity (see Figure 4). External stakeholders, government institutions, and business associations, emerge as some of the most active key players in the network, and may help bridging partnerships across WfD functional groups. These results suggest a high level of dependence on these three types of organizations across sectors for coordinating efforts.

Figure 4 - Network Reduction by Highest In-Degree (6-47)



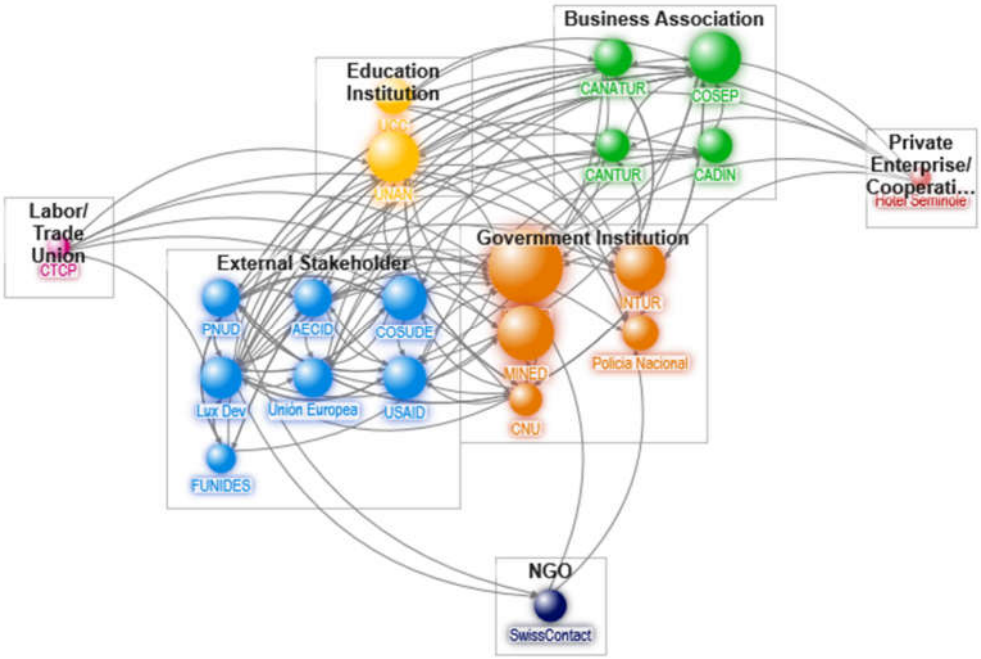
On the other hand, employment agencies, labor/trade unions, and private enterprise / cooperatives do not appear to engage in the same high level of collaborative activity, despite their general connections to other sectors. When these network reduction procedures are applied, none of these organizational types remain in the network suggesting that they are not involved in intensive cross sector collaborative activities. However, although labor/trade unions and private enterprise / cooperatives may not have extensive cross-sector ties, they may still be active players in the network. For example, when the network was reduced based on the highest closeness and Eigenvector centrality[10] scores, both types of organizations were identified (see Figure 5). These results suggest that although labor/trade unions and private enterprise / cooperatives may not engage in a high number of partnerships, they still retain some centrality and influence in the network.

The opposite can be observed in relation to NGOs, which have a generally high level of network activity but may not be as influential overall in the network. Figure 4 shows 3 NGOs present in the network when reduction measures are applied according to in-degree score. However, only one NGO appears in Figure 5, where we have

[10] Eigenvector centrality is one method of computing the "centrality," or estimated importance, of each node in a network (other examples are degree centrality, closeness centrality, or betweenness centrality). The calculation assumes that each node's centrality is the sum of the centrality values of the nodes that it is connected to.

reduced the network by highest closeness and eigenvector centrality. This indicates that while NGOs are plentiful across the network, they do not exert a corresponding level of influence within it. This finding is augmented by data showing high overall reciprocity for NGOs, but a relatively low in-degree score overall.

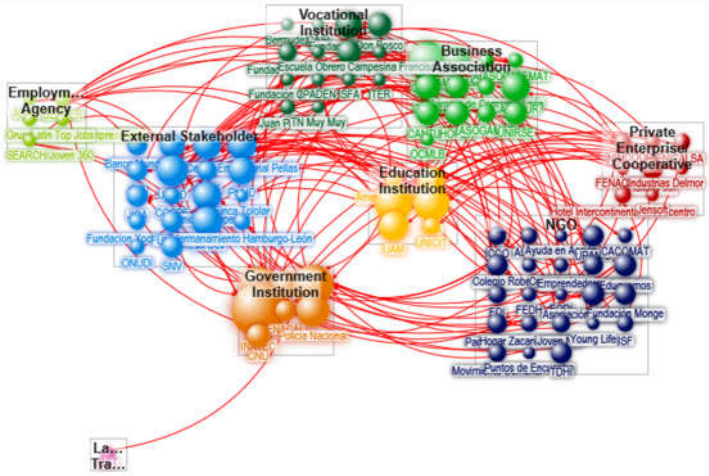
Figure 5 - Network Reduction by Highest Closeness (minimum .0033) and Eigenvector Centrality (minimum .0120)



Desired Ties: Desired linkages are indicative of social capital and prestige of key actors in the network. Table 2 presents those organizations, by group, with the highest number of desired in-degree ties (minimum of 10 / organization to be included). External stakeholders (in this case donors and foundations) have the highest diversity and overall score (94). Government has the second highest by a thin margin (93), however over half of these desired in-ties are for one agency, INATEC (47), with only two other government agencies (MINED, INTUR) included. Business associations and educational institutions also appear to have significant social capital and prestige in the network. No other groups are represented among institutions with more than ten desired in-ties. Labor unions and employment agencies reflect the lowest levels of desired in-ties, having 1 and 8 respectively.

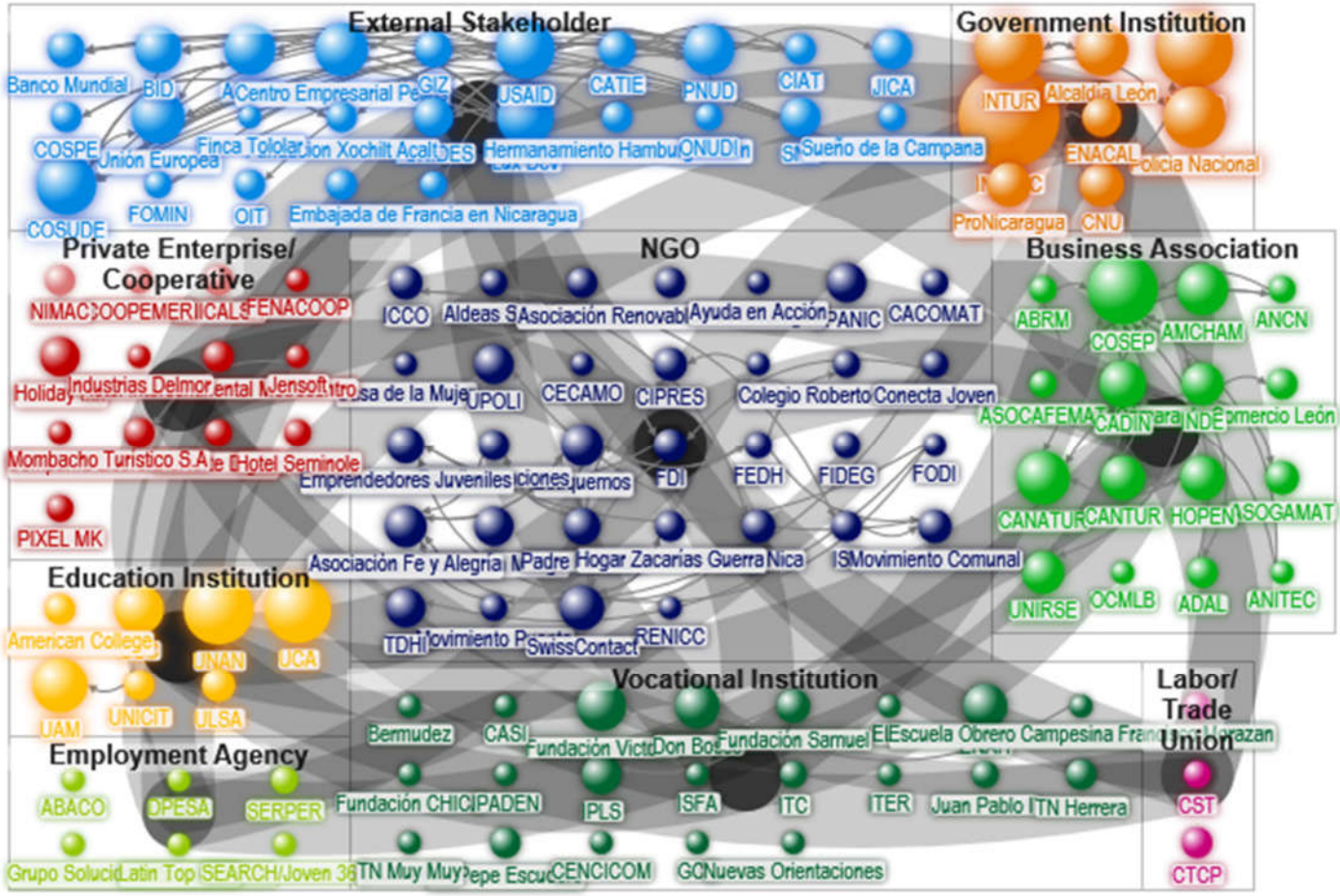
Table 2 - Desired In-Degree Ties

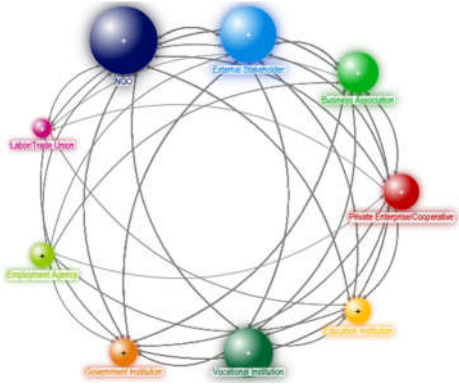
Group	Desired In-Ties	Organization	Desired In-Ties
Govt.	93	INATEC	47
		MINED	26
		INTUR	20
Business Association	41	COSEP	21
		AMCHAM	10
		CANATUR	10
Educational Institution	65	UNAN	21
		UCA	19
		UNI	13
		UAM	12
External Stakeholder	94	COSUDE (SDC)	15
		USAID	14
		Lux Dev	13
		Centro Empresarial Pellas	11
		Unión Europea (EU)	11
		AECID	10
		PNUD	10
		Fundación Telefonica (MOVISTAR)	10



Above map inclusive of all desired in-ties throughout the surveyed network, not simply the ones with top ten scores in the graph to the left.

Figure 6 - Intergroup and Intragroup Relations According to WfD Function





Map Above: Shows relations between groups with node size reflecting relative in-degree scores.

Map Left: Shows relations within (intra-group) and among groups (inter-group). Intragroup relations illustrated with thin lines. Intergroup illustrated with heavy lines. Size of node corresponds with number of in-degree ties for each actor.

Table 3 - Observations by Group

	Group	Key Observations
	External Stakeholders (Donors, Foundations, Research Orgs)	*Highly influential bridging group with strong reciprocal relationships across the network, although further bolstering the position of these actors is questionable for issues of sustainability.* • Partnerships most common among these groups. • High within-group density (3) • Highest within-group reciprocity (1) • Highest social capital and prestige • Heavily networked with Associations and government • Networked well with vocational and educational institutions, unions and NGOs • Inter-group bridging / coordinating actor, critical for connecting actors in the network
	NGOs	*Entrepreneurial go-getters with high levels of activity and strong relationships across the network, but constrained by a lack of influence.* • High within group density (4) • High within group reciprocity (2) • High overall network reciprocity, but low in-degree score indicating stronger partnerships but weaker overall network influence • Pro-active, entrepreneurial actors throughout the network, but not considered influential by others in the network
	Government	*Dominant group with dense internal relations, weak out-ties / reciprocity, and the centrality to bridge actors across the network* • Dominated by INATEC, a key hub actor • Highest within group density (1) • Average within-group reciprocity (4) • Second-highest social capital and prestige • Inter-group bridging / coordinating actor, critical for connecting actors in the network
	Private Enterprise, Coops (Employers)	*Weakly bridged actor with reasonably good connections to educational and vocational institutes but a lack of ties to intermediaries and themselves.* • Lowest within group density with only one intragroup tie. • Weak links to business associations (7) • Only 1 tie to employment agencies and 1 tie to Labor Unions • Relatively even balance of connections to NGOs, external stakeholders, government, vocational training and educational institutions • Weak betweenness centrality, not serving as bridges in the network
	Educational Institutions	*An actor group with diverse ties to other groups across the network and a significant degree of social capital and prestige within the network.* • Weak within-group ties • Relatively evenly split ties to other groups in the network • Average in-degree scores and centrality • Above average social capital and prestige

	Vocational Training Institutions	*Relatively weak ties, especially within its group and with employment agencies. Not effectively coordinating or serving as bridges with others in the network.* • Weak within-group ties • No ties to labor / trade unions or employment agencies • Some indications of donor capture among key Vocational Training institutions • Weak coordinating actor • Weak betweenness centrality, not serving as bridges in the network
INTERMEDIARIES	Business Associations 	*Strongly positioned group with a wide diversity of relations, influence across the network, strong bridging qualities, and an overall mandate for coordination.* • High within group density (2) • High within-group reciprocity (3) • Inter-group bridging / coordinating actor, critical for connecting actors in the network • Strong diversity of connections, both within and beyond their group • Lack of connections with private enterprises (7) and employment agencies (3)
	Employment Agencies 	*Players with a mandate for intermediary bridging across the network, but not linked to the extent implied by their function, especially with employers and vocational institutions. Relatively even distribution of ties and levels of influence in this small group of six actors.* • Small group with only six actors with a sum total of 17 overall ties, almost evenly split • No within group ties, possibly reflecting competitive pressures • Few ties with Employers (1), business associations (3) • No ties with vocational institutions or labor / trade unions • Weak coordinating actor • Weak betweenness centrality, not serving as bridges in the network
	Labor / Trade Unions 	*A small but potentially influential actor group with relatively few ties in the network and primarily connected to government.* • No within group ties. • Not connected to vocational institutions or employment agencies • Weak coordinating actor • Central position in the network, indicating influence despite a lack of overall partnerships • Weak betweenness centrality, not serving as bridges in the network

5.3 Comparative Sub-networks

Five key sub-networks were identified from the dataset in an attempt to gain an enhanced understanding of workforce development dynamics by both sector and working group, and make comparisons to the larger network as a whole. Three sectors of high activity among WfD network members and relevance to Nicaragua's economic growth were selected, including tourism, construction and agriculture. Two currently existing working groups oriented on WfD issues were also selected, *The Donor Coordination Group for Technical Training* and Nicaragua's *WfD Community of Practice* facilitated by COSUDE (Swiss Development Cooperation). Sub-networks are presented below in the order of their network density.

Sub-network 1 (Sector) – Tourism

Tourism is a key sector in Nicaragua, one which is strongly promoted by the government and has seen significant investor and consumer interest. During 2014, travel experts and specialized media listed Nicaragua as a must-visit destination expected to rise to become a hotspot in 2015. In 2014 alone, the Nicaraguan Tourism Board approved over US$100 million for the development of tourism projects. These projects are expected to generate around 1,600 jobs during the construction phase and more than 580 permanent jobs when fully established. As a result, there is a need for workers with a set of skills to supply the demand generated by the sector's growth.

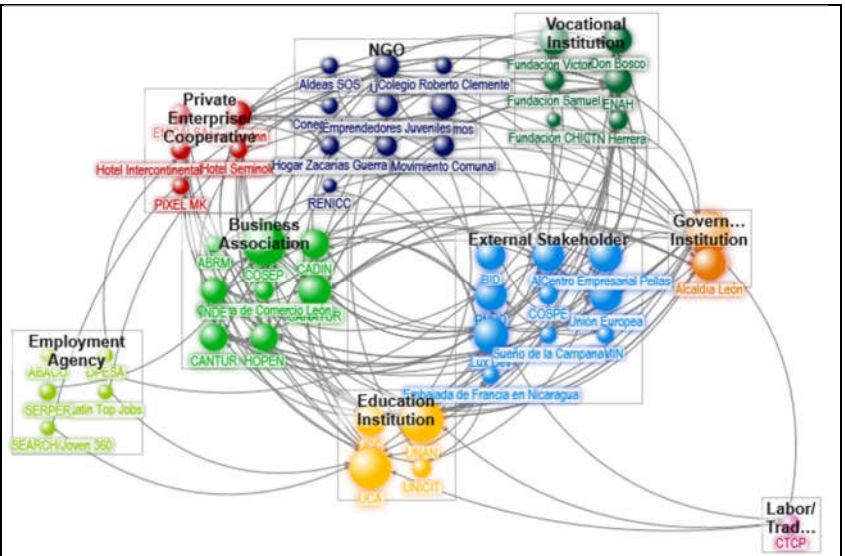
Based on the significant labor market demand in the tourism sector, the government and international donors have invested heavily in workforce development over the past few years. LuxDev has been the most significant donor, investing millions to re-define and improve the government-run National Tourism Training Institute (ENAH, Spanish acronym). Past USAID programming has supported sustainable tourism development, including skills training for entrepreneurs and for employees. Given these efforts and focus, the sector is seen as a well-organized and well-connected network for economic growth and workforce development. However, despite these efforts and the networks supported by them, most of the major hotels still say they prefer to train their own staff in the skills they expect and have low expectations of ENAH graduates. One of the hotels, Holiday Inn, has also established their own training school to serve their needs and those of other hotels around the country.

Tourism sector actors in the surveyed network comprised of 55 agencies that span all nine organizational types. Their relationships with one another form six distinct components, a common occurrence when extracting sub-networks from an overall network, which has the effect of increasing distance between actors. This results in an average distance of 2.5. Compared to the larger network, the tourism sector is almost twice as dense (5.5%), and reciprocated relationships are significantly more common (35%). The dense network graphs show us that that collaboration is very common within tourism.

The tourism sector appears to represent a unique opportunity to engage key network actor groups. As with construction, the sector has high involvement of employment agencies (5 of 6 in the whole network). Unlike construction however, it also has high participation of business associations and private enterprises / cooperatives.

Table 4 - Tourism Sector

Network Phenomena	Combined Network	
	Tourism Actors	Overall Network
Basic Network Features		
Size	55	131
Ties	165	566
Components	6	1
General Measures of Network Cohesion		
Density	0.05556	0.03324
Betweenness Centrality	64.618	207.48
Closeness Centrality	0.044	0.003
Distance between Actors		
Diameter	6	5
Average Distance	2.457	2.576
Strength and Clustering		
Reciprocity	0.2132 0.3515	0.1411 0.2473
Clustering Coefficient	0.131	0.137



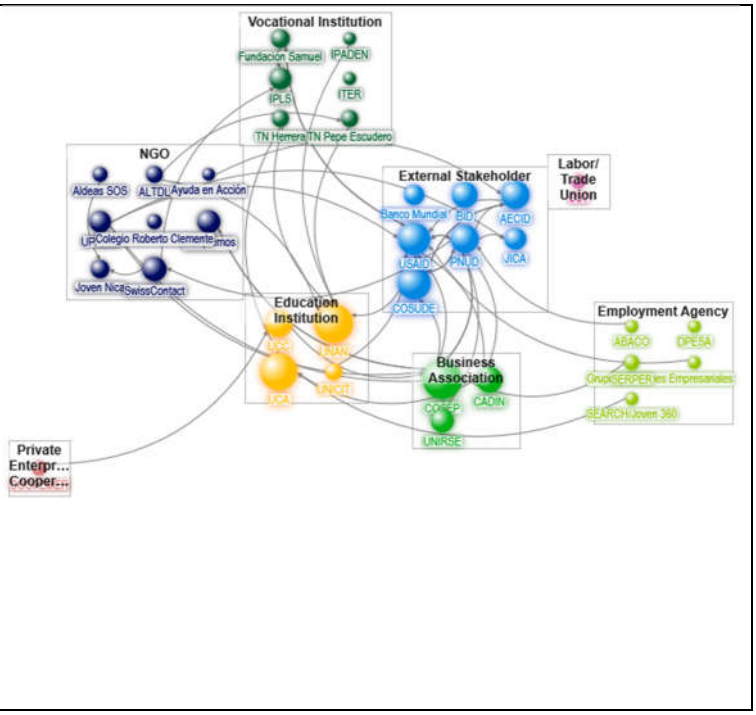
Sub-network 2 (Sector) – Construction

Nicaragua's construction industry is currently experiencing significant growth. Several major infrastructure projects are expected to spur additional growth for this industry, including the controversial construction of an interoceanic canal, as well as ports, hospitals, retail space, hotels, roads and a continuous demand for housing projects, primarily for low- and middle-income families. Developers have recognized this demand and invested in low-income housing during the past few years, particularly in Managua. Consequently, there is a growing demand for high-quality skilled workers in all areas of the construction industry, as companies are seeking workers with the required technical skills to cover the sector's demand. Those supporting growth in the construction sector have generally expressed a concern that there is a lack of needed skills among Nicaraguans, and it is more common for construction projects to hire labor from neighboring countries.

Construction sector actors in the surveyed network include 35 organizations. Organizations are a bit more distant from one another (an average of 2.9 steps) than in the larger network, although the network is more dense (5%). We attribute high average distance to be due to the 7 unconnected components of the network, as opposed to the overall single component network. The network is comprised of organizations representing eight of the nine group types (no government actors) suggesting that cross-sector collaboration is quite common. Reciprocity is virtually the same as that in the overall network. Like tourism, employment agencies have a relatively strong engagement in this sector, with a presence of five out of six in the overall network. The participation of business associations and private enterprises however is significantly lower than the tourism sector, although they are nonetheless present.

Table 5 - Construction Sector

Network Phenomena	Combined Network	
	Construction Actors	Overall Network
Basic Network Features		
Size	35	131
Ties	48	566
Components	7	1
General Measures of Network Cohesion		
Density	0.04834	0.03324
Betweenness Centrality	45.657	207.48
Closeness Centrality	0.010	0.003
Distance between Actors		
Diameter	6	5
Average Distance	2.866	2.576
Strength and Clustering		
Reciprocity	0.1429 0.2500	0.1411 0.2473
Clustering Coefficient	0.110	0.137



Sub-network 3 (Sector) – Agriculture

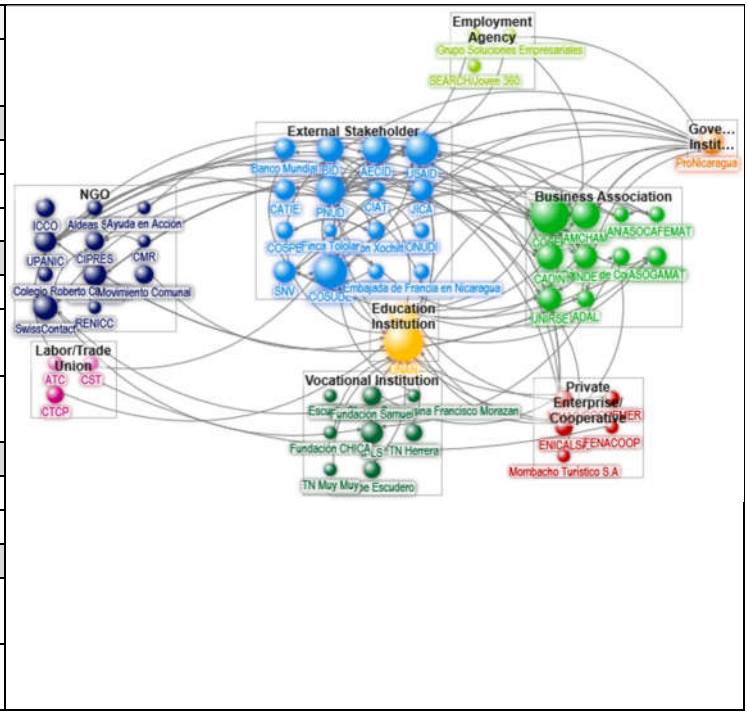
Agriculture and fisheries employ approximately 32% of Nicaragua's workforce, making it a key engine for economic development. While the sector has experienced declines over the decades, agricultural production and processing is still a major sector for foreign direct investment in Nicaragua. Key agricultural products include coffee, sugar cane, tobacco and palm oil. Much of the labor in the agricultural sector is low-skill, and TVETs appear to provide very few offerings of relevance to this sector.

Among the three sector-based sub-networks, agriculture includes the largest number of actors included in our study (n=59). However, ties among them are significantly less frequent, resulting in a network density (3.7%) only slightly higher than the overall network and 2 percentage points less than tourism and construction. Distance between actors (2.7) is comparable to tourism and construction, and slightly higher than the network as a whole. As with the other sectors, this is likely due to the multiple component nature of this "network slice." At 24%, reciprocity is approximately the same as the construction sector and overall network. Differences identified here might be attributable to the rural, more disconnected informal nature of the agriculture sector, compared with tourism and construction.

The agricultural sector includes activity of all nine network actor groups, but only barely so for government, educational institutions, and employment agencies. While employment agency participation is weak, pivotal actors with strong representation in this network include a very strong representation of business associations and the highest representation of labor / trade unions among the sectors analyzed. Private enterprise and NGO participation is significant. As well, we do find significant numbers of vocational institutions in the sector, indicating that they are likely better positioned than educational institutions in this field. There is very high representation of external stakeholders in this sector, perhaps indicating it as an area of high donor interest.

Table 6 - Agriculture Sector

Network Phenomena	Combined Network	
	Agriculture Actors	Overall Network
Basic Network Features		
Size	59	131
Ties	125	566
Components	8	1
General Measures of Network Cohesion		
Density	0.03653	0.03324
Betweenness Centrality	79.458	207.48
Closeness Centrality	0.006	0.003
Distance between Actors		
Diameter	6	5
Average Distance	2.714	2.576
Strength and Clustering		
Reciprocity	0.1364 0.2400	0.1411 0.2473
Clustering Coefficient	0.104	0.137



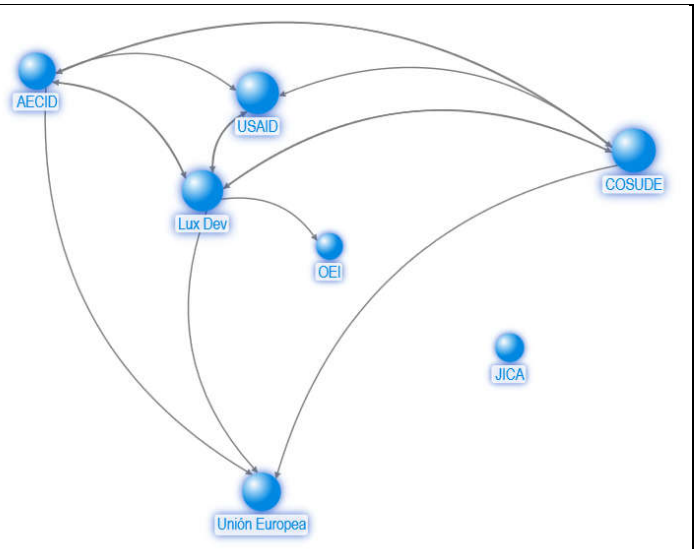
Sub-network 4 (Working Group) – The Donor Coordination Group for Technical Training

In recent years, LuxDev has convened a donor coordination group around all aspects of education. A sub-group within that, focused on technical education, has begun to meet regularly. The sub-group is composed of 6 members: AECID, COSUDE, LuxDev, USAID, JICA, European Union, and OEI (Organization of Ibero-American States). This sub-group's primary objective is to coordinate efforts and investments, in order to ensure more effective use of resources and reduce duplicate efforts. In addition to regular meetings, with support from LuxDev, the group has created and is maintaining a database of donor efforts. They have observed that some of the donors are highly focused on specific sectors, many are providing significant support to INATEC at the national level, many are supporting specific government-run TVET centers, and only a few are supporting NGOs and private TVET centers.

Of the six participating organizations, the research shows that five of the organizations are connected to one another and one (JICA) is isolated from the others. Within this small group, density is high (27%) and partnerships reported are strong (50% are reciprocated, and high weighted score for relationship strength). Some respondents reported only information exchange relationships with other group members and some reported collaborative relationships (including some group members who reported both types of relationships with other members). This suggests that the coordination group has encouraged information exchange to lead to deeper collaboration. Although the group meets regularly, not all members reported relationships (even for information exchange) with all other members. This would suggest that the perceived value of the meetings is not high enough to keep the relationships top of mind.

Table 7 - Donor Coordination Group for Technical Training

Network Phenomena	Combined Network	
	Donor Coord Actors	Overall Network
Basic Network Features		
Size	7	131
Ties	14	566
Components	2	1
General Measures of Network Cohesion		
Density	0.3333	0.03324
Betweenness Centrality	1.429	207.48
Closeness Centrality	0.133	0.003
Distance between Actors		
Diameter	2	5
Average Distance	1.11	2.576
Strength and Clustering		
Reciprocity	0.400 0.5714	0.1411 0.2473
Clustering Coefficient	0.495	0.137



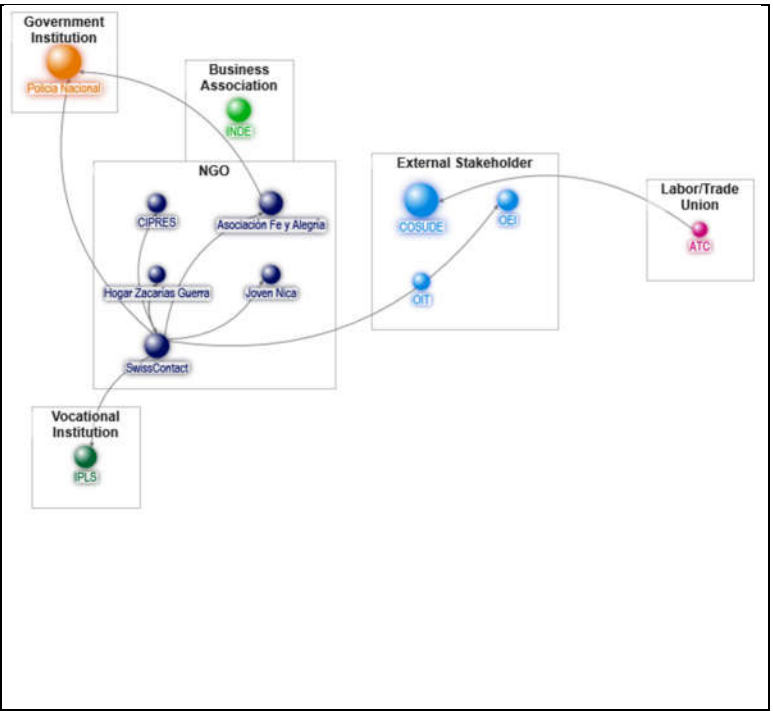
Sub-network 5 (Working Group) – WFD Community of Practice

The "Development of Skills for Employability" project, funded by COSUDE and implemented by SwissContact, established a Community of Practice bringing together 12 actors representing a variety of sectors and geographic regions of Nicaragua. The Community of Practice aims to develop and strengthen a network of public and private training providers based on the training of field staff; the development of support materials; and the delivery of technical assistance. The results of this strengthening and knowledge capture effort will be systematically assessed and used for policy development on technical and vocational training. According to its members, this sub-network has significant administrative support, provides value, and generates active participation of the members.

Analysis shows that while the *Workforce Development Community of Practice is* working together to share knowledge and skills, the sub-network is very fragmented and centralized around one actor, SwissContact. Other than relationships reported with the community of practice coordinators SwissContact and COSUDE, only one relationship was reported among members (connecting a government institution and an NGO).

Table 8 - WfD Community of Practice

Network Phenomena	Combined Network	
	WfD Cmty Actors	Overall Network
Basic Network Features		
Size	12	111
Ties	10	301
Components	4	1
General Measures of Network Cohesion		
Density	0.007576	0.03702
Betweenness Centrality	3.333	174.036
Closeness Centrality	0.225	0.004
Distance between Actors		
Diameter	2	5
Average Distance	1.441	2.559
Strength and Clustering		
Reciprocity	0.111 0.200	0.1560 0.2699
Clustering Coefficient	0.085	0.150



5.4 Ego Networks (networks of individual actors and their connections)

For each organization, we calculated three measures of influence and examined the top 10 organizations based on their scores: in-degree (reflecting influence), closeness centrality (reflecting closeness or connectedness to other nodes), and betweenness centrality (reflecting the degree to which organizations bridge relationships with others in the network). These procedures identified 15 unique organizations. Most were government institutions (n=5) and external stakeholders (n=5). Five of the 15 organizations emerged as key players across all three measures (INATEC, INTUR, COSEP, UNAN, and Lux Dev), suggesting that these actors have a high degree of influence, are closely connected, and often bridge relationships with others in the network. Four of these five organizations are active in all three target geographies; COSEP is active in Managua only.

To examine the relative contribution of each of these organizations to the network structure, we graphed the network without each of these agencies. In each iteration, the network structure remained, suggesting that although these organizations are central to the sector, the network would not fragment if one of these organizations were to no longer be active.

Table 9 - Ego Metrics

Key Actor Ego Metrics								
Type	**Name**	**Location**	**Out-degree**	**In-Degree**	**Betweenness Centrality**	**Closeness Centrality**	**Reciprocation**	**Strength[11]**
Key Actors: Highest In-Degree (Top 10)								
Government Institution	INATEC	MN, LE, MAT	0	47	4051	4.35×10^{-3}	0	19.9
	MINED	MN, LE	1	26	1300	3.43×10^{-3}	0	26.3
	INTUR	MN, LE, MAT	6	20	788	3.86×10^{-3}	0.182	21.8
	Policia Nacional	MAT	0	16	908	3.52×10^{-3}	0.000	17.8
Association	COSEP	MN	11	21	1290	3.89×10^{-3}	0.231	17.8
Education Institution	UNAN	MN, LE, MAT	9	21	1797	3.97×10^{-3}	0.071	18.2
	UCA	MN, LE, MAT	1	19	786	3.33×10^{-3}	0.053	18.8
External Stakeholder	COSUDE	MN, LE, MAT	7	15	575	3.82×10^{-3}	0.158	18.2
	USAID	MN, LE, MAT	8	14	523	3.66×10^{-3}	0.222	12.1
	Lux Dev	MN, LE, MAT	23	13	1,067	4.02×10^{-3}	0.385	11.7
Key Actors: Highest Closeness Centrality (Top 10)								
Government Institution	INATEC	MN, LE, MAT	0	47	4051	4.35×10^{-3}	0	19.9

[11] Averaged on the basis of both in and out-ties on a 1 (minimum) to 45 (maximum) point scale.

	INTUR	MN, LE, MAT	6	20	788	3.86×10^{-3}	0.182	21.8
	CNU	MN, LE, MAT	12	7	292	3.79×10^{-3}	0.267	25.9
Association	COSEP	MN	11	21	1290	3.89×10^{-3}	0.231	17.8
Education Institution	UNAN	MN, LE, MAT	9	21	1797	3.97×10^{-3}	0.071	18.2
External Stakeholder	Lux Dev	MN, LE, MAT	23	13	1,067	4.02×10^{-3}	0.385	11.7
	PNUD	MN, LE, MAT	24	10	1,363	3.91×10^{-3}	0.308	7.43
	COSUDE	MN, LE, MAT	7	15	575	3.82×10^{-3}	0.158	18.2
	USAID	MN, LE, MAT	8	14	523	3.66×10^{-3}	0.222	12.1
	FUNIDES	MN	11	5	335	3.65×10^{-3}	0.333	7.8
Key Actors: Betweenness Centrality								
Government Institution	INATEC	MN, LE, MAT	0	47	4051	4.35×10^{-3}	0	19.9
	MINED	MN, LE	1	26	1300	3.43×10^{-3}	0	26.3
	Policia Nacional	MAT	0	16	908	3.52×10^{-3}	0.000	17.8
	INTUR	MN, LE, MAT	6	20	788	3.86×10^{-3}	0.182	21.8
Association	COSEP	MN	11	21	1,290	3.89×10^{-3}	0.231	17.8
Education Institution	UNAN	MN, LE, MAT	9	21	1797	3.97×10^{-3}	0.071	18.2
	UCA	MN, LE, MAT	1	19	786	3.33×10^{-3}	0.053	18.8
NGO	SwissContact	MN, LE, MAT	8	7	612	3.56×10^{-3}	0.071	30.9
External Stakeholder	PNUD	MN, LE, MAT	24	10	1,363	3.91×10^{-3}	0.308	7.43
	Lux Dev	MN, LE, MAT	23	13	1,067	4.02×10^{-3}	0.385	11.7
Key Actors – Qualitative/Role Selection								
Vocational Institution	Fundacion Victoria	MN	2	9	239	3.16×10^{-3}	0.100	10.9
	ENAH	MN, LE, MAT	11	7	129	3.22×10^{-3}	0.636	19.1
External Stakeholder	COSUDE	MN, LE, MAT	7	15	575	3.82×10^{-3}	0.158	18.2

Pivotal Ego Actors:

INATEC (National Technological Institute - Government): INATEC is the institution responsible for technical and vocational education for adults over the age of 14. INATEC offers both professional and technical certificates and degrees in 43 public TVET centers, and regulates educational programs in approximately 250 private TVET centers. The primary responsibilities of INATEC include: guiding and implementing policies for vocational and technical training; implementing vocational training programs for ages 14 and older; implementing special training programs for women, the disabled, cooperatives, and small enterprise; organizing, planning, monitoring, and evaluating training activities for semi-skilled, skilled, basic technical, and technical labor; strengthening vocational opportunities based on the local context and labor demands; and providing technical assistance to managers, technical centers, and vocational institutions. Being the primary institution for the provision and regulation of technical and vocational education, INATEC is a key actor for the study.

Egonet highlights:

- Highest among all actors for both desired and actual in-degree ties.
- Dominant central actor, with betweenness centrality more than doubling any other.
- Key hub actor whose central position could facilitate flow of information or obstruct it.
- Zero score for reciprocity is a result of INATEC not participating directly in the survey. However, it can be safely assumed that reciprocity would be low given its extremely high in-degree score.
- Strength of relationships that were indicated by alters (direct connections) are above average.

INTUR (Nicaraguan Institute of Tourism - Government): Recognizing the benefits that tourism brings to the Nicaraguan economy, INTUR, the tourism governing body, is focusing on promoting, coordinating and facilitating the development of the tourism sector and the country's image as a prime Central American destination. INTUR works along with private sector tourism associations, donors, and INATEC's ENAH (National Tourism Training Institute) to develop training programs to meet the needs of the sector.

Egonet highlights:

- High in-degree score indicating influence in the network.
- High betweenness centrality indicating bridging qualities.
- Second-highest closeness centrality, indicating very strong connectedness across the network, especially with business associations and donors. This was to be expected given the strength of relationships within the tourism sector overall.
- High number of desired connections to INTUR (indicating social capital and prestige).
- Significantly less dominant than INATEC among government actors.

COSEP (Higher Council of Private Enterprise - Business Association): COSEP is an apex association of other business associations. COSEP's mission is to promote and defend the economic, political and social conditions that ensure the private sector free enterprise, respect for private property, and business strengthening. As the most important private sector association and a member of INATEC's Board of Directors, COSEP plays a major role in aligning private sector demand with TVET offerings. Recently, COSEP has been a key advocate for private sector to change an INATEC tax policy that they feel is limiting opportunity for improving the quality of technical training.

Egonet highlights:

- High in-degree, closeness and betweenness centrality scores.
- Most prominent business association in the network. This supports their function as an advocate for private enterprise interests with INATEC.
- Majority of relationships are with NGOs, external stakeholders, government.
- They have no reported connections to private enterprise directly. They also lack connections to vocational institutions and unions, indicating a valuable opportunity for network development.
- COSEP has by far the most intra-group relations, making it the key coordinating actor for business association activities overall.

UNAN (National Autonomous University of Nicaragua - Educational Institution): UNAN is a public higher education institution. However, it is academically, organically, administratively and financially autonomous. It comprises nine faculties and a polytechnic institute of health, distributed on three campuses in the city of Managua. It also has four regional university campuses located in the cities of Estelí, Matagalpa, Carazo and Chontales. In 2014, UNAN, in coordination with INATEC, created a virtual platform to develop online courses aimed at teachers from INATEC and the general public. Despite being an educational institution with obvious interests in providing workforce skills to a subset of the workforce, they are not generally cited as a central actor in workforce development. However, their network statistics show them as quite central and a valuable network actor.

Egonet highlights:

- High in-degree, closeness and betweenness centrality scores.
- Most prominent educational institution in the network.
- Strong diversity of connections to other network actor groups, but no other educational institutions.
- Highest levels of connectivity with government and external stakeholders among educational institutions.
- Average connections to NGOs, business associations, private enterprise and vocational institutions.
- No connections with employment agencies, indicating another possible opportunity for network development.

Lux Dev (Luxembourg Development Cooperation Agency - External Stakeholder): The “Institutional Support to Vocational Training in Hospitality and Tourism” Project is Lux Dev's most significant contribution to technical education and vocational training, and is implemented in collaboration with INATEC. As we have already seen, tourism is a sector receiving strong interest and investment, and through their support to this sector, Lux Dev has become a central actor in workforce development.

Egonet highlights:

- High closeness and betweenness centrality scores.
- Above average in-degree scores.
- While USAID and COSUDE had higher in-degree scores, Lux Dev exceeds them both in closeness and betweenness centrality, meaning that they have a relatively weaker influence, but have managed to be a key actor in terms of network connectedness and bridging of relationships.

- Connections are well balanced to groups across the network. The only group to which they are not connected are employment agencies, indicating another opportunity for network strengthening.

SwissContact (NGO): SwissContact is an implementing agency with a range of projects focused on improving the labor market in Nicaragua. They work directly with INATEC on regulatory and policy improvements, as well as curriculum development and networking. They are also a central actor with connections to TVET Centers, organizing the *WfD Community of Practice* (see Section 5.3).

Egonet highlights:

- Highest level of centrality among NGOs in the network, indicating their high-level of involvement in supporting a wide range of WfD activities.
- Highly central bridging actor within the *WfD Community of Practice.*

Fundacion Victoria (Vocational Institution): Fundacion Victoria is a non-profit TVET Center, founded and still primarily funded by the Nicaraguan Beer Company. Originally, the center was only available to the company's employees and their families, but now students are competitively selected from a national applicant base every year. Victoria is generally viewed as one of the strongest TVET Centers in the country with high job placement rates and a strong network of private sector employers.

Egonet highlights:

- Only vocational training institute with in-degree in top 20 of all actors.
- Has a surplus of connections to external stakeholders vs. other actors.
- Also shows connections to private enterprise and business associations, though fewer than would be implied based on their high-job placement rates and apparent responsiveness to labor market needs.

ENAH (National Tourism Training Institute - Public Vocational Institution): ENAH has received substantial investment from Lux Dev and the government to become a model sector-focused national TVET center. Due to the level of attention and resources it has received, as well as its ability to focus on one sector, ENAH has developed a strong, diverse network.

Egonet highlights:

- ENAH seems to be an entrepreneurial actor among vocational institutions, with the highest out-degree score among them, and many overall connections to both vocational institutions and other actors.
- ENAH is (1) extremely well supported by donors, in particular Lux Dev; (2) is one of the few Public TVET Centers included in the analysis; and (3) as a national vocational institution for a growing sector, has a large number of private sector ties (primarily hotels)

6. THE MANAGUA NETWORK

The department of Managua, where the capital city of Nicaragua is located, has an estimated population of almost 1.5 million (24% of the total population). The Department has a territorial extension of 3,465 km², and is located at the southwestern shore of the Managua Lake, on the pacific side of the country. Managua is the department with the major economic and commercial activity of the country, including large industrial parks hosting numerous companies working under trade zone regime. In addition, it houses many services and government entities, universities and hospitals, one of the only two international airports in Nicaragua, and the main hotels and country's businesses. There are seven INATEC technological institutes in Managua (languages, tourism and hospitality, commercial, agriculture and livestock, and industrial).

Network Metrics: Among the three departments, the workforce development network is largest in Managua, comprised of 417 organizations identified and 89 surveyed core network members. This is likely due to Managua's overall size relative to the other two networks, and the presence of national organizations based in Managua and operating in multiple surveyed regions. Density of Managua's core network is 5.2%, more so than Leon (4.9%) and Matagalpa (5.1%), but still relatively sparse by absolute standards. Similar to the other networks, there were a maximum of 5 steps distance between actors, with the average distance being 2.419. Clustering coefficients were also average in Managua (0.159), compared with Leon (0.114) and Matagalpa (0.162). The frequency of reciprocated ties in Managua was 29%, slightly higher than Leon (28%) and Matagalpa (24%). Overall, this data shows us that Managua's network composition was very similar to that of the other two networks. *See Figure 1 for Network Master Data Table.*

Intragroup Relations: Relationships within and across WFD sectors seem to be strongest in Managua. Compared to the whole network, intragroup relationships are significantly denser in Managua. Correspondingly, relationships are closer. This is particularly the case for vocational institutions, NGOs, external stakeholders and business associations. However, private enterprises / cooperatives, employment agencies, and labor / trade unions had no within-group connections.

Intergroup Relations: Educational institutions in Managua distinguished themselves by having an evenly balanced number of ties with all 8 other actor groups across the network. This contrasts with vocational institutions, which have a high concentration of relationships with external stakeholders and NGOs, and no ties with employment agencies or labor / trade unions. Similar to the overall network, Managua's private enterprises lack connections with employment agencies and labor / trade unions. As well, labor / trade unions are not connected to any actors in three other groups, employment agencies, vocational institutions and business associations.

Figure 7 - Managua Network Core Map (n=89 + 3 unconnected)

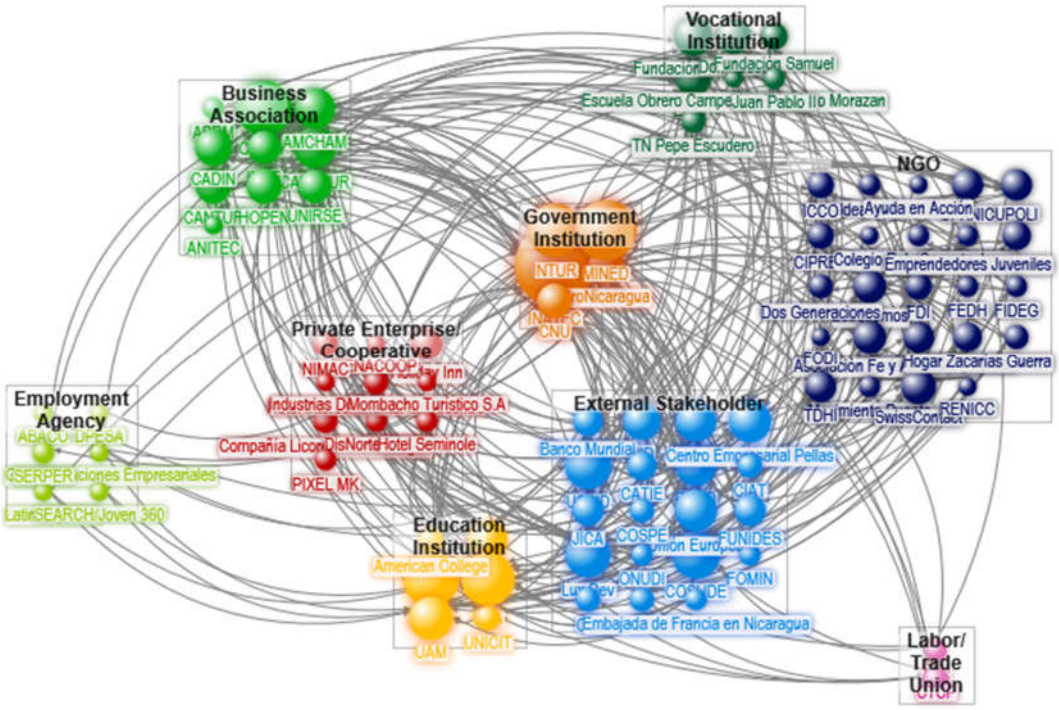
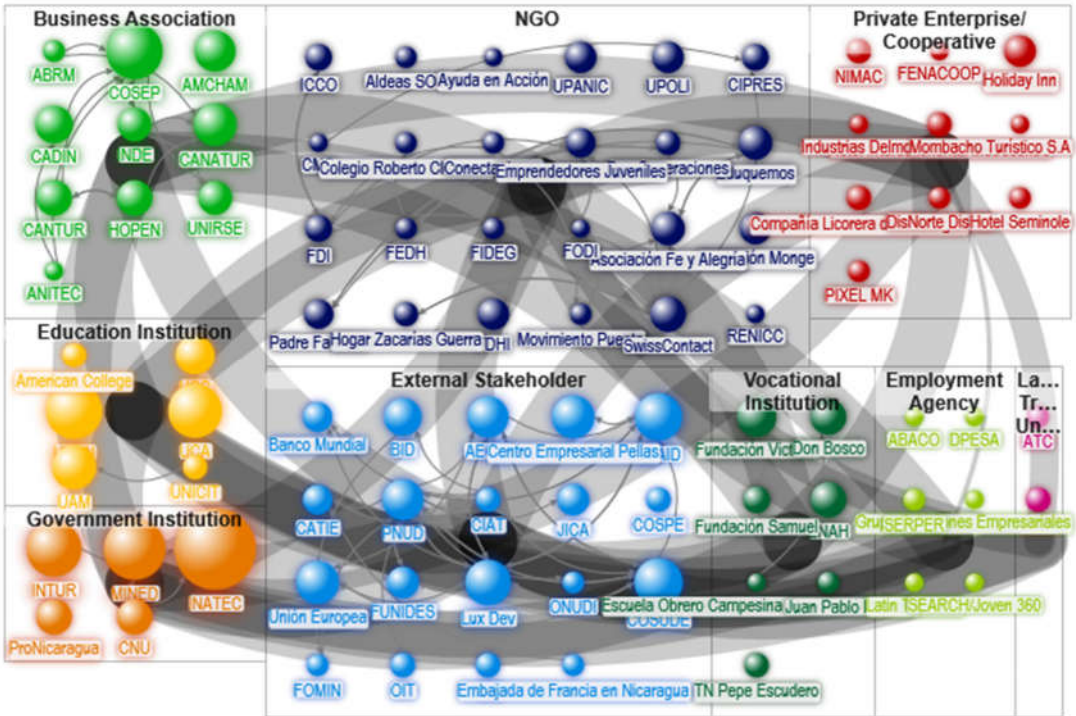


Figure 8 - Managua Intergroup and Intragroup Relations by WfD Function



7. THE LEON NETWORK

The department of León has an estimated population of 400,000 (6.48% of the total population). It has a territorial extension of 5,138 km², and is located about 50 miles northwest of Managua, and 11 miles north of the Pacific Ocean coast. The city of León, the department's capital, is Nicaragua's second largest city, and has long been considered a university town and the intellectual center of the nation, with the university founded here in 1813. León is also an important tourism, industrial and commercial center, producing and exporting sugar cane, cattle, peanut, plantain, sorghum and leather goods. There are three INATEC technological institutes in León (commercial, agriculture and livestock, and industrial).

Network Metrics: Overall, Leon's core network data does not have appreciable differences from Managua and Matagalpa. The workforce development network in Leon is slightly smaller than Matagalpa, making it the smallest of those surveyed. 323 actors were identified that work in Leon, and 62 surveyed core network members. Density of the core network is 4.9%, making it slightly less dense that Managua (5.9%) and Matagalpa (5.1%). Leon's network had the highest maximum number of steps between actors (6), with the average distance between actors also being slightly greater than the other networks, at 2.670. The frequency of reciprocated ties among Leon network members was average, at 28%. *See Figure 1 for Network Master Data Table.*

Intragroup Relations: In Leon, relationships among government institutions were denser (25%), but relationships among NGOs more sparse (1.4%) compared to the whole network. The population of NGOs operating in Leon comprised 15% of the Leon network, significantly lower than the 24% comprising the percentage of NGOs operating in the overall network. External stakeholders do enjoy slightly high levels of collaboration among each other in Leon (density=10%, closeness 1.859), relative to the overall network (density=8%, closeness 2.059). There is no intragroup collaboration observed among four actor groups in Leon: private enterprise / cooperatives, educational institutions, employment agencies and labor/trade unions.

Intergroup Relations: Overall there appear to be less intergroup connections among actors in Leon. There are no single groups, including government and external stakeholders, that are connected to all other groups in the Leon network. Reflecting their smaller numbers (n=9), NGO connections are much reduced in the Leon network. Employment agencies (n=4) are linked only to business associations, external stakeholders, and educational institutions. All other actors appear to follow similar intergroup relation patterns as those in the whole network.

Figure 9 - Leon Core Network Map

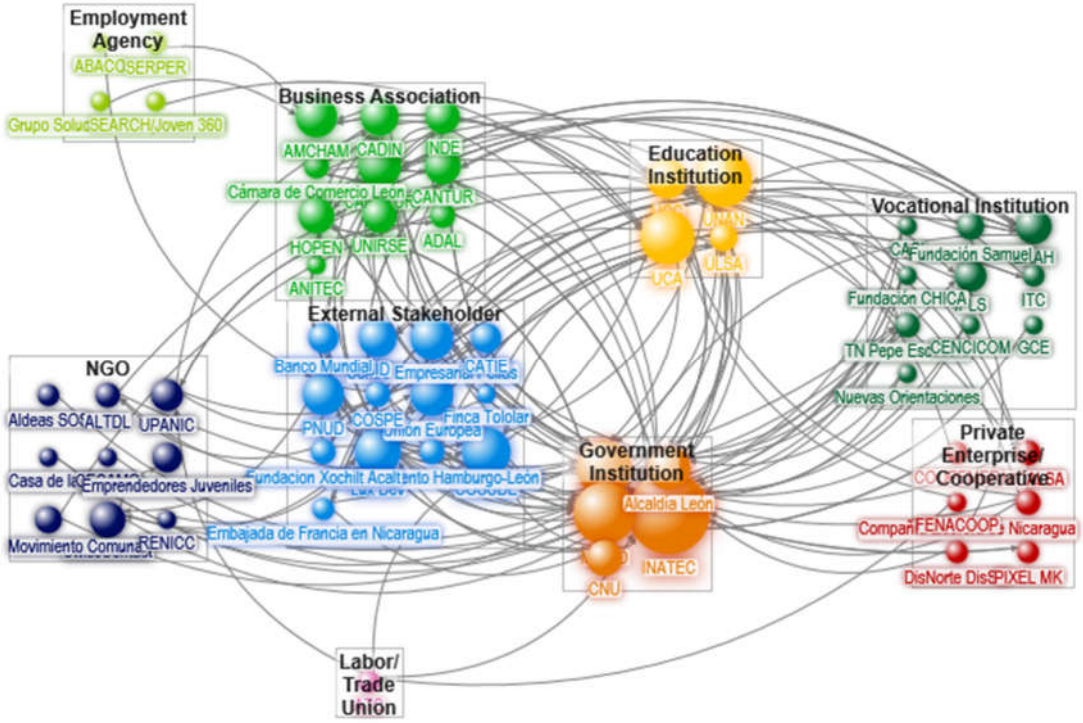
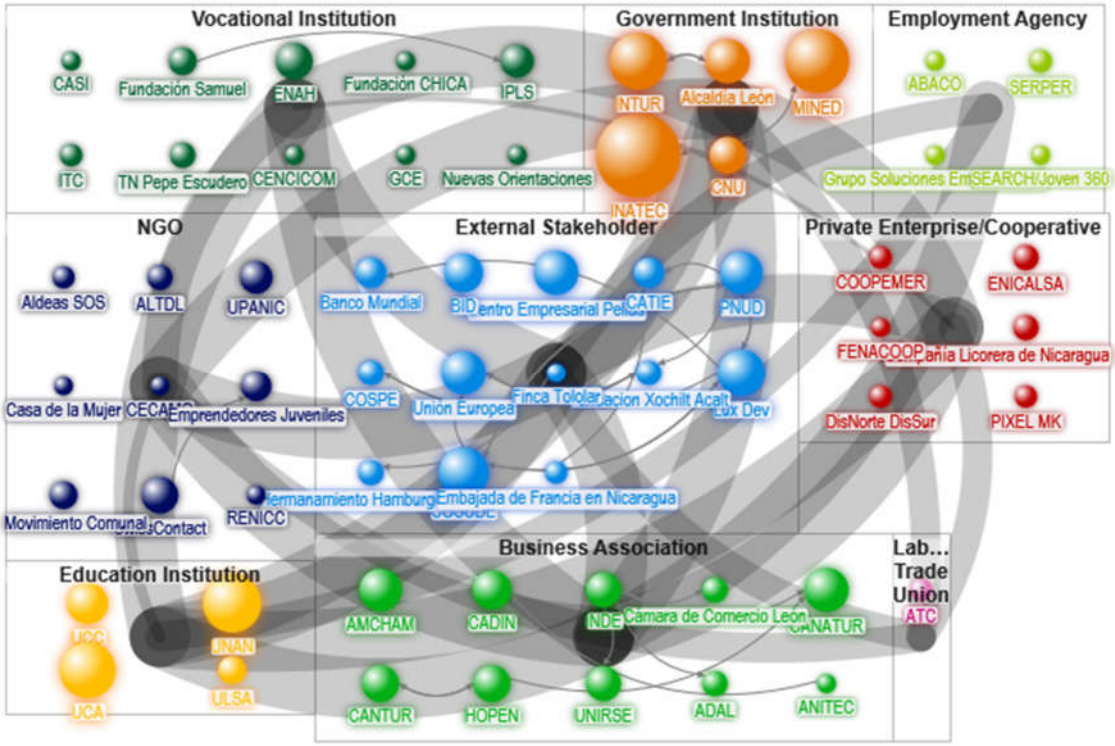


Figure 10 - Leon Intergroup and Intragroup Relations by WfD Function



8. THE MATAGALPA NETWORK

The department of Matagalpa has a population of 547,500 (8.88% of the total population). It has a territorial extension of 6,804 km², and is located in the northern mountains, about two hours from Managua. Currently the department is the second most populous in Nicaragua after the national capital (Managua), and the most diversified in production. It produces and exports beef, cheese, coffee, cacao, onions, tomatoes and mixed fruits and vegetables. For local consumption it produces flowers, wood, corn, beans, fruits and vegetables, and is recognized as one of Nicaragua's largest and fastest growing commerce and trade centers. A large part of the economy in Matagalpa depends on eco-tourism, with nature hikes, bird watching and coffee tours being very common tourism offerings throughout the region. There are three INATEC technological institutes in Matagalpa (commercial, agriculture and livestock, and industrial).

Network Metrics: Overall data for Matagalpa's workforce development network does not have appreciable differences from the survey's other two networks. The Matagalpa network is slightly larger than Leon, with 325 actors identified that work in Matagalpa, and 65 surveyed core network members. Density of the core network is 5.1%, making it appreciably less dense than Managua (5.9%) and slightly denser than Leon (4.9%). Closeness reflected the same trends as the other networks, with a maximum distance between Matagalpa actors of 5, and an average of 2.524. Reciprocity among network actors was lowest in Matagalpa at 24%, as opposed to 28% and 29% in Leon and Managua respectively. *See Figure 1 for Network Master Data Table.*

Intragroup Relations: In Matagalpa, intragroup relationship density among NGOs (d=7%) and external stakeholders (d=13%) are higher than the general network. As is the case in Leon, NGO presence is much weaker overall however, with a total of 8 operating there, comprising only 12% of the network as opposed to 24% in the overall network. Four groups have no relationships among their actors, most noticeably vocational training and educational institutions, and as with other networks, employment agencies and labor/trade unions. The smallest numbers of employment agencies (n=3) and labor trade union (n=2) actors exist in the Matagalpa network.

Intergroup Relations: External stakeholders are one of two groups in the Matagalpa network that have relations with all other groups, with relatively even ties throughout the network. Business associations is the other group with ties to all other actor groups in the network, and there are slightly more in Matagalpa (n=12) than there are in either Managua or Leon, which both have 10. Private enterprise / cooperatives are relatively weakly represented in this network (n=5) and generally have weak ties to 7 of the 8 other groups (employment agencies exempted). Government appears to play a relatively large role in the Matagalpa network, with in-ties much greater than other actors and a diverse array of connections with 7 of the 8 other groups (employment agencies exempted). All other actors follow similar patterns to those found in the overall network.

Figure 11 - Matagalpa Core Network Map (n=65)

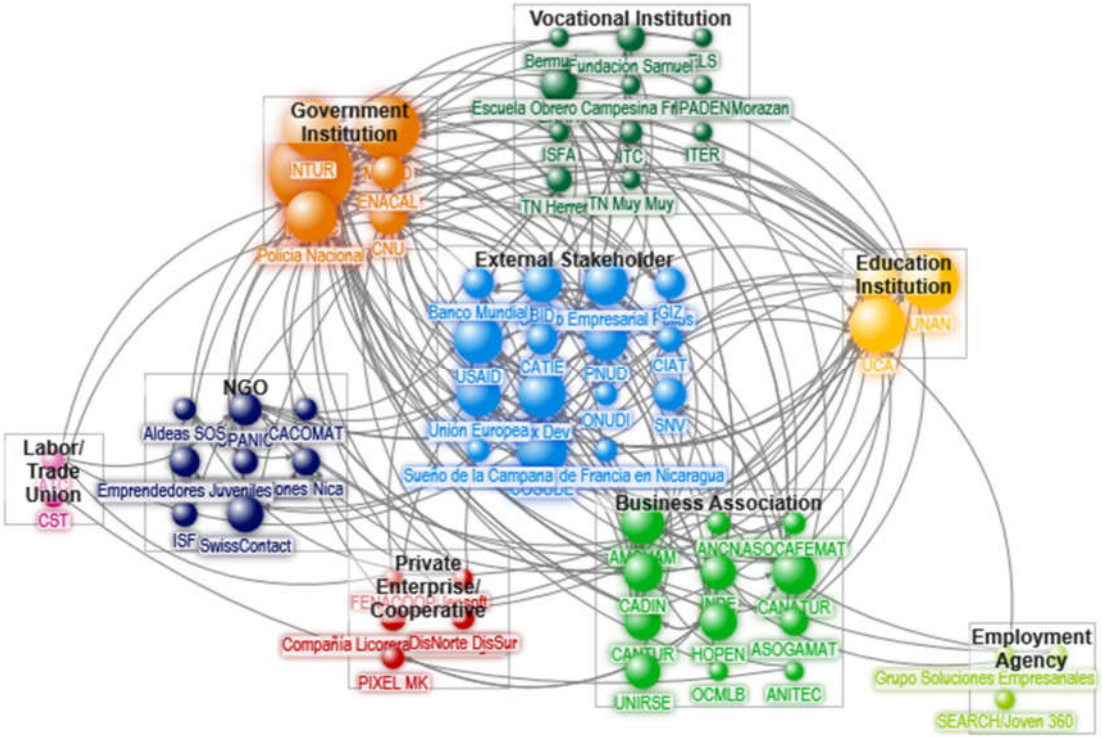


Figure 12 - Matagalpa Intergroup and Intragroup Relations by WfD Function

9. CONCLUSIONS AND RECOMMENDATIONS FOR WfD PROGRAMMING

Taken as a whole, Nicaragua's WfD network is a diffuse one with an overall lack of coordination, lack of dominant actors, ease of access across functional groupings, and numerous opportunities for network development. While we do not have a baseline or other data sets from which to draw comparative inferences, the above-presented observations on sub-networks and potential for change indicate that there is strong potential for WfD efforts to at least double overall network density and increase reciprocated relationships on the order of 10%. There is a significant degree of resilience in the network, with no single actor or groupings of them single-handedly holding the network together. While INATEC is a central and dominant actor in the network, connections between WfD functions are rich and diversified, meaning that no one single actor is able to control access to others or block information / coordination across the network.

Our conclusions and recommendations for WfD network development programming are contained below. In the spirit of applied research, we urge any agencies adopting these recommendations to contact LINC so their activities might be incorporated into future research efforts assessing longitudinal network impact.

Strengthening WfD functions

Despite the mandate of **intermediaries** to connect actors across the network, with the possible exception of business associations, they are surprisingly weak. We see tremendous opportunities for WfD network development associated with intermediary engagement, specifically in regards to increasing the overall connectivity and influence of employment agencies and unions, in addition to a concentration on a set of specific relationships that business associations appear to be lacking. On the other hand, the influence of **government and external stakeholders** (primarily donors and foundations) on the WfD network appears over-sized, which is likely unconducive to long-term network development. For these actors, more facilitation-based network development strategies may be in-order, working through sustainable labor market actors.

NGOs, as the largest population of actors included in our survey, profile in many of the ways that we might expect. They are the entrepreneurs of the network, eager partners that may have the connectivity needed to rapidly diffuse information and coordination. However, our centrality and desired partnerships data show us that while they are numerous, they are constrained by a lack of overall influence. This means that careful targeting of their means of engagement is warranted, depending on the objectives of network development efforts.

Vocational training institutions profile weakly across the network. While they do have significant representation, relationships with other groups are comparatively few, they have very weak intragroup linkages, and are correspondingly weak in their coordinating functions. While they do have limited relations with private enterprise / coops (employers), they have none with employment agencies in particular.

Specific recommendations for WfD actor group engagement include:

Employment Agencies: The six employment agencies surveyed in our core network had a paucity of connections across the network. Their most frequent connections are to educational institutions (5),

even more so than employers (1). They had no connections with vocational training institutions. These key job-seeking connections between employers and vocational / educational institutions have tremendous potential for development. A focus on these connections in particular could offer significant benefit in bridging vocational institutions' currently weak ties with employers. Further, we note that employment agencies have the weakest connections of any other network group with external stakeholders, indicating only a two donor relationships. This indicates to us that employment agencies may be an overlooked group on the part of external stakeholders, particularly donors. It is noteworthy that all six employment agencies profile very closely, with similar sizes and number of ties and are not coordinating internally as a group. This might offer some opportunities for incubation or other group-based coordinating strategies, assuming a willingness to coordinate among these private sector actors that may be inhibited by competitive pressures. Finally, raising the profile of employment agencies and the services they offer could be a highly effective means of bolstering their position in the network. This could be accomplished through marketing or other business development support.

External Stakeholders: External stakeholders are composed primarily of donors, and as their name implies, would ideally be external to the WfD network. Their prominence in terms of numbers and influence across the network indicates quite the opposite, with a number of WfD network development efforts likely dependent on their intervention and resources. While it is difficult to ascertain the exact role that this actor group is taking in the WfD network, we urge facilitation-based strategies rather than direct intervention in the network itself for sustainable impact.

NGOs: This is the group with highest representation in the surveyed network, profiling as proactive, entrepreneurial actors but lacking overall centrality and influence in the network. Their connectedness is widespread, something that can be utilized to the advantage of WfD network, especially when considering strategies that link less connected actors and groups (e.g. employment agencies, labor unions). However, their obvious lack of influence would appear to limit their prospects in relation to activities that require convening of powerful actors (e.g. policy, advocacy), establishment of network hubs or other high profile activities.

Business Associations: Among the most influential and plentiful actors in the network, and uniquely among these groups, a natural labor market actor. This opens the possibility of multiple interventions via associations, however, it is evident that they are already playing a quite strong role in the network, which may limit their capacity to grow it overall. Nonetheless, we see this group as a powerful non-governmental counterbalance to government and perhaps the most viable of all the actor groups for hub-based strategies (discussed further below). However, one key area of connectivity where business associations appear to be surprisingly lacking is direct relations with employers (7). This would appear to exacerbate the problem of a lack of coordination among employers themselves, which have virtually no ties among each other in the surveyed network. Network development efforts might be expended on better understanding this evident gap, and developing programming that fills it. Such programming might include bolstering of association member services, rallying businesses around key WfD policy issues, among others.

Vocational Institutions: Despite a strong showing of vocational institutions in our sample, they have only seven direct connections with employers and none with employment agencies. This contrasts significantly with educational institutions, which had 1/3 the number of surveyed actors and approximately the same number of direct connections with employers and several connections with employment agencies. It appears that vocational institutions do enjoy a high level of collaboration with

external stakeholders, however it may be that the activities they support are not particularly focused on job placement. For these reasons, we recommend that WfD support strategies consider growing direct linkages to employers, and linkages via employment agencies.

Labor / Trade Unions: This is the smallest group of actors in our sample, which has nonetheless demonstrated some degree of influence in the network. This influence may be tied to labor unions' generally strong ties to government, the most influential group in our survey. Network development efforts with labor unions might be best utilized to expand their relatively weak reach throughout the network to bolster their intermediary role. As well, engagement of labor unions should be considered in relation to policy or governance-related WfD initiatives.

Private enterprises / cooperatives: As employers, private enterprises / cooperatives surveyed in this research did not substantially engage with each other, or with several specific actor groups that we might have expected. This most notably includes business associations and employment agencies, both of which are key intermediaries to serve their workforce needs. We recommend that assistance strategies specifically address this gap through programming that links these actors, as explained under "Employment Agencies" and "Business Associations" write-ups above. Further, weak links to vocational institutions should be strengthened, also outlined above under "Vocational Institutions". Finally, intragroup coordination can be enhanced significantly through B2B events and joint initiatives.

Government: This is the densest group in the network, exhibiting high levels of influence and bridging across sectors. This group's strong standing in the WfD network is largely due to INATEC, which, due to its central position, does demonstrate the potential to strengthen or to constrain the network, although there is strong intergroup diversity of ties across the network. WfD support strategies should be undertaken in recognition of this actor group's high levels of influence on the network, which should be engaged to the maximum extent possible to ensure success of activities.

Educational Institutions: This actor group has a high level of social capital and prestige in the network, and overall well distributed ties among groups. Intragroup ties are relatively weak, introducing the prospects for network development activities the emphasize cooperation and collaboration among them (see "Overall Network Hub Development" write-up below. Beyond this, we do not see particularly strong opportunities to leverage educational institutions in a robust way for overall WfD network development.

Sector-based strategies

Our comparative analysis of three sector-based sub-networks in Section 5.3 shows tourism and construction to be significantly stronger than the overall network. The practical effect of this is faster information dissemination, more efficient uptake of new strategies and technologies, and overall enhanced coordination. On this basis, it is reasonable to infer that workforce development support efforts will exhibit more robust results when organized around specific sectors, most specifically in this case being tourism and construction. In addition to this, the three different sectors analyzed engage specific actor groups more intensively than others. In this regard, it is reasonable to infer that a concentration on specific sectors will differentially impact upon specific actor groups. Sector selection efforts should bear these differential impacts in mind when designing interventions.

Tourism catalyzes intermediaries and employers: Tourism is unique among the three sub-networks analyzed in regards to its high level of engagement of intermediaries, agents exhibiting high potential for WfD network development in Nicaragua. It includes five of six employment agencies, a large number of business associations, and very substantial presence of private enterprises / cooperatives. Activities targeting network development among these pivotal actors will likely have more robust results when organized around the tourism sector.

Construction: Sub-network metrics show us a significantly stronger network that is apparent in the overall network, making it another good sector to rally programming around. With the presence of five of the six employment agencies in this network, it has the further benefit of robust engagement of this key intermediary actor. Activities focused on this group will likely see more robust results when organized around the construction sector as well.

Agriculture: The agricultural sub-network engages over 50% of the actors in our surveyed network, although its overall metrics profile only slightly stronger than the network as a whole. This might be attributed to the unique character of the sector relative to tourism and construction, more rurally based and geographically diffuse. Interventions undertaken in this sector are likely to have a stronger than normal impact on business associations and labor / trade unions, considering their high levels of participation in this network. Activities targeting these actors might consider a focus on the agricultural sector.

Overall network hub development

The diffuse, underdeveloped state of Nicaragua's WfD network and lack of any dominant actors capable of placing significant limits upon it indicate strong opportunities for hub-based overall network development strategies. With the possible exception of COSEP, the network demonstrably lacks a *centralized and entrepreneurial* non-governmental actor or cluster, capable of working with multiple actors and groups to efficiently reduce overall distance between actors and increase network density.

Among non-governmental actors, there are a several actors and groups that exhibit high potential to bridge multiple WfD functional areas and strongly impact upon the overall network. Associations appear to be the most obvious choice, however their current position in the network is indicative of past or ongoing efforts in this sphere, which may limit potential for additional network development. Educational institutions have fairly wide reach across the network, and bring with them prestige and social capital to play such a role. Vocational institutions would be another possibility, although are somewhat limited by weaker reach.

Incubation-based strategies among small actor groups

Employment agencies and labor / trade unions have been consistently highlighted as small actor groups that likely have a pivotal role to play in the network. While these groups are likely not sufficiently equipped at present to take the overall network stage, investment can be made to increase their numbers and influence in the network. Several strategies could be employed to this effect, including business support, organizational development, marketing and informational campaigns, among others.

Strengthened communities of practice

Sub-network data on the *Donor Coordination Group for Technical Training* and *WfD Community of Practice* indicate a fairly weak state of coordination in the sector at present. We would have expected

these groups to profile much stronger than the overall network, but this was not the case. Some investment in bolstering these and other relevant communities of practice might be warranted.

Coordination within groups

Several groups profiled in our study had very weak intragroup relations, including educational institutions, vocational institutions, private enterprises / cooperatives, employment agencies and labor / trade unions. Incentives for these actor groups to coordinate and collaborate among each other should be considered. This might include grant-making activities associated with joint initiatives, convening of working / coordination groups, and conducting events to bring actors together and establish joint priorities.

ANNEX A - LIST OF SURVEYED NETWORK ACTORS

Nicaragua WfD Surveyed Network Actors						
Type	**Activity Regions**			**Surveyed Actor**	**In-Degree**	**Out-Degree**
	MN	**LE**	**MAT**			
Active in All Three Locations (Departments)						
Government Institution	✓	✓	✓	CNU (Consejo Nacional de Universidades)	7	17
				INATEC (Tecnológico Nacional)	47	0
				INTUR (Instituto Nicaraguense de Turismo)	20	20
				MINED (Ministerio de Educación)	26	1
Education Institution	✓	✓	✓	UCA (Universidad Centroamericana)	19	5
				UCC (Universidad de Ciencias Comerciales)	9	40
				UNAN (Universidad Nacional Autónoma de Nicaragua)	21	23
Vocational Institution	✓	✓	✓	ENAH (Tecnológico Nacional de Hotelería y Turismo)	7	17
				Fundación Samuel	3	9
				ITER (Instituto Tecnológico y de Energías Renovables)	0	3
Business Association	✓	✓	✓	AMCHAM (Cámara de Comercio Americana de Nicaragua)	10	8
				ANITEC (Asociación Nicaraguense de la Industria Textil y Confección)	0	12
				CADIN (Cámara de Industria de Nicaragua)	8	13
				CANATUR (Cámara Nacional de Turismo)	11	10
				CANTUR (Cámara Nicaraguense de la Micro, Pequeña y Mediana Empresa Turística)	7	10
				HOPEN (Asociación de Propietarios de Pequeños Hoteles de Nicaragua)	7	10
				INDE (Instituto Nicaraguense Desarrollo Empresarial)	6	20
				UNIRSE (Unión Nicaraguense para la Responsabilidad Social Empresarial)	6	0
Employment Agency	✓	✓	✓	ABACO	0	7
	✓	✓	✓	Grupo Soluciones Empresariales	0	15
Labor/Trade Union	✓	✓	✓	ATC (Asociación de Trabajadores del Campo)	1	13
NGO	✓	✓	✓	Aldeas SOS	1	11
				Emprendedores Juveniles	4	4
				Puntos de Encuentro	0	4
				SwissContact	7	10
				UPANIC (Unión de Productores Agropecuarios de Nicaragua)	5	20
				Young Life	0	4
Private Enterprise or Cooperative	✓	✓	✓	Compañía Licorera de Nicaragua	2	8
				DisNorte DisSur	1	4
				FENACOOP (Federación Nacional de Cooperativas Agropecuarias y Agroindustriales)	0	8
				PIXEL MK	1	4
				SEARCH/Joven 360	0	4
External	✓	✓	✓	Banco Mundial (World Bank)	4	0

Nicaragua WfD Surveyed Network Actors						
Type	**Activity Regions**			**Surveyed Actor**	**In-Degree**	**Out-Degree**
	MN	**LE**	**MAT**			
Stakeholder				BID (Banco Interamericano de Desarrollo, Interamerican Development Bank)	8	5
				CATIE (Centro Agronómico Tropical de Investigación y Enseñanza)	4	0
				Centro Empresarial Pellas	11	6
				COSUDE (Agencia Suiza para el Desarrollo y la Cooperación, Swiss Development Cooperation)	15	11
				Embajada de Francia en Nicaragua (French Embassy in Nicaragua)	1	12
				Lux Dev (Luxembourg Development)	13	29
				PNUD (Programa de Naciones Unidas para el Desarrollo, UNDP)	10	44
				Unión Europea (European Union)	11	6
Active in Two of Three Locations (Departments)						
Vocational Institution	✓	✓		TN Pepe Escudero (Tecnológico Nacional Pepe Escudero)	2	15
	✓		✓	Escuela Obrero Campesina Francisco Morazan	0	6
		✓	✓	ITC (Instituto Técnico Creativo)	1	11
Employment Agency	✓	✓		SERPER (Servicios de Personal S.A.)	1	4
NGO	✓	✓		Colegio Roberto Clemente	1	6
	✓	✓		RENICC (Red Nicaraguense de Comercio Comunitario)	0	8
	✓		✓	Dos Generaciones	2	4
External Stakeholder	✓	✓		COSPE (Cooperación para el Desarrollo de Países Emergentes)	2	10
	✓		✓	CIAT (Centro Internacional de Agricultura Tropical)	2	16
	✓		✓	ONUDI (Organización de las Naciones Unidas para el Desarrollo Industrial, UNIDO)	1	9
	✓		✓	USAID (Agencia de los Estados Unidos para el Desarrollo Internacional)	14	14
Active in One Location (Departments)						
Government Institution	✓			ProNicaragua	7	11
		✓		Alcaldía León	11	8
			✓	ENACAL (Empresa Nicaraguense de Acueductos y Alcantarillados)	5	6
			✓	Policia Nacional	16	6
Education Institution	✓			American College	2	19
	✓			UAM (Universidad Americana)	12	8
	✓			UNICIT (Universidad Iberoamericana de Ciencia y Tecnología)	2	11
		✓		ULSA (Universidad Tecnológica La Salle)	3	8
Vocational Institution	✓			Don Bosco (Centro Juvenil Don Bosco)	7	9
	✓			Fundación Victoria	9	12
	✓			Juan Pablo II (Instituto Técnico Especializado Juan Pablo II)	1	13

Nicaragua WfD Surveyed Network Actors						
Type	**Activity Regions**			**Surveyed Actor**	**In-Degree**	**Out-Degree**
	MN	**LE**	**MAT**			
		✓		CASI (Instituto Politécnico José Gregorio Tercero Flores)	0	4
		✓		CENCICOM (Centro Científico de Computación)	0	7
		✓		Fundación CHICA	0	6
		✓		GCE (Gestión y Capacitación Empresarial)	0	1
		✓		IPLS (Instituto Politécnico La Salle)	5	8
		✓		Nuevas Orientaciones	0	5
			✓	Bermudez (Centro de Enseñanza Técnica Bermúdez)	0	1
			✓	ELS (English Language School)	0	3
			✓	INTEC (Instituto Tecnológico Jehova Jireh)	0	1
			✓	IPADEN (Tecnológico Nacional Agroindustrial del Norte)	0	6
			✓	ISFA (Instituto Técnico San Francisco de Asís)	0	5
			✓	TN Herrera (Tecnológico Nacional Benedicto Herrera)	2	19
			✓	TN Muy Muy (Tecnológico Nacional Santiago Baldovino)	0	7
Business Association	✓			ABRM (Asociación de Bares y Restaurantes de Managua)	1	6
	✓			COSEP (Consejo Superior de la Empresa Privada)	21	15
		✓		ADAL (Asociación de Algodoneros y Agricultores de León)	2	4
		✓		Cámara de Comercio León	2	8
			✓	ANCN (Alianza Nacional de Cafetaleros de Nicaragua)	1	16
			✓	ASOCAFEMAT (Asociacion de Cafetaleros de Matagalpa)	1	16
			✓	ASOGAMAT (Asociacion de Ganaderos de Matagalpa)	3	9
			✓	OCMLB (Organización de Ciegos de Matagalpa Luis Braille)	0	15
Employment Agency	✓			DPESA (Desarrollo Profesional y Empresarial)	0	4
	✓			Latin Top Jobs	0	5
Labor/Trade Union	✓			CTCP (Confederación de Trabajadores de la Economía Social Solidaria)	2	17
			✓	CST (Central Sandinista de Trabajadores)	1	2
NGO	✓			Asociación Fe y Alegría	6	20
	✓			Asociación Renovables de Nicaragua	2	9
	✓			Ayuda en Acción	0	13
	✓			CIPRES (Centro para la Promoción, Investigación y Desarrollo Rural y Social)	3	4
	✓			CMR (Coordinadora de Mujeres Rurales)	0	10
	✓			Conecta Joven	1	16
	✓			Eduquemos	6	14
	✓			FDI (Fundación Déjame Intentarlo)	3	17
	✓			FEDH (Foro de Educación y Desarrollo de la Iniciativa por Nicaragua)	1	11

Nicaragua WfD Surveyed Network Actors						
Type	Activity Regions			Surveyed Actor	In-Degree	Out-Degree
	MN	LE	MAT			
	✓			FIDEG (Fundación Internacional para el Desarrollo Económico Global	1	6
	✓			FODI (Fundación para la Formación y el Desarrollo Integral)	0	16
	✓			Fundación Monge	5	5
	✓			Hogar Zacarías Guerra	2	15
	✓			ICCO (Interchurch Cooperative for Development Cooperation)	3	3
	✓			Movimiento Puente	1	2
	✓			Padre Fabretto (Asociación Familia Padre Fabretto)	4	7
	✓			TDHI (Tierra de Hombres Italia)	5	3
	✓			UPOLI (Universidad Politécnica de Nicaragua)	5	20
		✓		ALTDL (Asociación Las Tías de León)	2	5
		✓		Casa de la Mujer	0	3
		✓		CECAMO (Asociación Centro de Capacitación de la Mujer Obrera)	0	3
		✓		Movimiento Comunal	3	3
			✓	CACOMAT (Cámara de Comercio de Matagalpa)	1	5
			✓	ISF (Infancia Sin Fronteras)	2	9
			✓	Joven Nica	3	3
Private Enterprise or Cooperative	✓			Holiday Inn (Hotel Holiday Inn)	5	8
	✓			Hotel Intercontinental Metrocentro	2	8
	✓			Hotel Seminole	1	12
	✓			Industrias Delmor	0	9
	✓			Mombacho Turístico S.A	0	4
	✓			NIMAC (Nicaragua Machinery Company)	2	6
		✓		COOPEMER (Cooperativa de Educación Nuestra Señora de la Merced)	1	5
		✓		ENICALSA (Empresa Nicaraguense Alemana S.A.)	2	7
			✓	Jensoft (Jensoft Enterprise)	0	17
External Stakeholder	✓			AECID (Agencia Española de Cooperación Internacional para el Desarrollo, Spanish Agency for International Cooperation)	10	9
	✓			FOMIN (Fondo Multilateral de Inversión del grupo BID)	1	6
	✓			FUNIDES (Fundación Nicaraguense para el Desarrollo Economico y Social)	5	12
	✓			IBIS (IBIS Nicaragua)	2	5
	✓			JICA (Agencia de Cooperación Internacional del Japón, Japanese Agency for International Cooperation)	5	12
	✓			OIT (Organización Internacional del Trabajo, ILO)	2	2
		✓		Finca Tololar	0	5
		✓		Fundacion Xochilt Acalt	2	3
		✓		Hermanamiento Hamburgo-León	2	16

Nicaragua WfD Surveyed Network Actors						
Type	Activity Regions			Surveyed Actor	In-Degree	Out-Degree
	MN	LE	MAT			
			✓	GIZ (Cooperación Alemana al Desarrollo, German Development Cooperation)	4	7
			✓	SNV (Servicio Holandés de Cooperación al Desarrollo, Netherlands Development Organization)	5	10
			✓	Sueño de la Campana	1	10

The In-Degree and Out-Degree include overall responses for the entire network (Out-Degree also includes non-surveyed actors).

ANNEX B - QUESTIONAIRE (ENGLISH TRANSLATION)

Nicaragua Workforce Development ONA Questionnaire

Respondent 1	**Respondent 2 (must be from the same organization)**
1. First name: _____ 2. Last name: _____ 3. Position: _____ 4. Employment status: FT / PT / Consultant / Volunteer 5. Individual Phone: _____ 6. E-mail: _____	1. First name: _____ 2. Last name: _____ 3. Position: _____ 4. Employment status: FT / PT / Consultant / Volunteer 5. Individual Phone: _____ 6. E-mail: _____
Respondent 3 (must be from the same organization)	**Respondent 4 (must be from the same organization)**
1. First name: _____ 2. Last name: _____ 3. Position: _____ 4. Employment status: FT / PT / Consultant / Volunteer 5. Individual Phone: _____ 6. E-mail: _____	1. First name: _____ 2. Last name: _____ 3. Position: _____ 4. Employment status: FT / PT / Consultant / Volunteer 5. Individual Phone: _____ 6. E-mail: _____

Organizational Background Information

1. Official Organization Name: ___
   _____

2. Other Names by which your organization is known:
   a. _____
      _____
   b. _____
      _____
   c. _____
      _____

3. Local office address, phone:
   _____
   _____

   _____
   _____

   _____
   _____

4. In which of the following departments does your organization have active operations to improve the labor market?
   a. ___Managua
   b. ___Leon
   c. ___Matagalpa

5. How old is your organization in years?
   _____

6. How many employees does your organization have?
   a. ___0-5
   b. ___6-50
   c. ___51+

7. Please indicate which of the following labor force development beneficiaries you support:
   a. _____Job-seekers in the formal sector
   b. _____Job-seekers in the informal sector
   c. _____Entrepreneurs
   d. _____Cooperatives
   e. _____Indigenous populations
   f. _____Women
   g. _____Youth
   h. _____The family of our own employees

8. Please indicate which economic sectors your organization's workforce development activities relate to:
   a. ___Agriculture, cattle, hunting, forestry
   b. ___Fishing
   c. ___Mining and quarries
   d. ___Manufacturing
   e. ___Electricity, gas and water
   f. ___Construction
   g. ___Trade
   h. ___Hotels and restaurants / Tourism
   i. ___Transportation and storage
   j. ___Communications / ICT
   k. ___Finance
   l. ___Real estate and rental
   m. ___Business services
   n. ___Education
   o. ___Social and health services
   p. ___Other community, social and personal services

9. Please indicate the **one type** that best categorizes your organization: *[NOTE: present only the principal categories from a to h and once the respondent has selected that, present sub-categories]*

   a. Private Enterprise or Business Association
      i. ___Private Sector Employer
      ii. ___Business Association / Industry Association / Chamber
      iii. ___Cooperative
   b. Education Institutions
      i. ___Public High School
      ii. ___Private High School
      iii. ___Public University
      iv. ___Private University
   c. Professional or Technological Training Institutions
      i. ___Public TVET Center
      ii. ___Private TVET Center
   d. Government Institution
      i. ___Local Government
      ii. ___National Government
   e. Intermediary / Employment Agency
      i. ___public
      ii. ___private
   f. _____Labor / trade / worker rights union or organization
   g. NGO that does
      i. ___advocacy (for job seekers / workforce)
      ii. ___employment / work opportunities
      iii. ___services for youth
      iv. ___services for women
   h. External Stakeholders
      i. ___foundation
      ii. ___international donor
      iii. ___Research organization

10. Please indicate **up to two** other functions that your organization engages in: *[NOTE: respondents are not required to choose additional categories if they do not apply to the organization]*

    a. Private Enterprise or Business Association
       i. ___Private Sector Employer
       ii. ___Business Association / Industry Association / Chamber
       iii. ___Cooperative
    b. Education Institutions
       i. ___Public High School
       ii. ___Private High School
       iii. ___Public University
       iv. ___Private University
    c. Professional or Technological Training Institutions
       i. ___Public TVET Center
       ii. ___Private TVET Center
    d. Government Institution
       i. ___Local Government
       ii. ___National Government
    e. Intermediary / Employment Agency
       i. ___public
       ii. ___private
    f. _____Labor / trade / worker rights union or organization
    g. NGO that does
       i. ___advocacy (for job seekers / workforce)
       ii. ___employment / work opportunities
       iii. ___services for youth
       iv. ___services for women
    h. External Stakeholders
       i. ___foundation
       ii. ___international donor
       iii. ___Research organization

Questions about the relationships / connections of the organization:

Introduction: Now I would like to ask you about the relationships that your organization has with other organizations, institutions, and companies. I have three questions that correspond to three types of relationships: (1) formal / contractual relationships for material exchange (payments, products and services); (2) collaborative relationships to conduct activities / communications; (3) relationships for the exchange of information and learning. Please only consider relationships that contribute to workforce development. This includes relationships for material exchange, collaboration, and information exchange about:

- Capacity building / training / education (theoretical and practical) specifically to improve the employment status of employed or unemployed individuals
- Job placement services or support to find or improve employment
- Facilitating entrepreneurism and supporting entrepreneurs
- Financial or technical support for any of the above activities

1. Please list the organizations / institutions / companies that support workforce development with which your organization has had a **relationship for the provision of products or services** during the past 12 months.
   For each institution named, please indicate your perception of the strength of the relationship (1 = very weak; 3 = average; 5 = very strong)
   Examples of this type of relationship could include contracts / agreements / grants to implement projects, payments for services or products, donations and sponsorships, etc. (NOTE: this does not include payment of membership dues to an association or chamber)

2. Please list the organizations / institutions / companies that support workforce development with which your organization has had a **relationship for collaboration on shared initiatives** during the past 12 months.
   For each institution named, please indicate your perception of the strength of the relationship (1 = very weak; 3 = average; 5 = very strong)
   Examples of this type of relationship could include advocacy, lobbying, research, and implementation of activities or communications.

3. Please list the organizations / institutions / companies that support workforce development with which your organization has had **a relationship for the exchange of information and learning** during the past 12 months.
   For each institution named, please indicate your perception of the strength of the relationship (1 = very weak; 3 = average; 5 = very strong)
   Examples of this type of relationship could include participation with other organizations in working groups, coordination meetings, informational meetings, direct exchange of information through email / phone / meetings, membership in an association that provides information, etc.

4. *NOTE: after completing the three previous questions, ask for contact information of any organization mentioned for which we do not already have contact information:*
   "We do not have a contact at XYZ organization. Could you please provide us contact information for the organization so that we may interview them as well?"

Notes for enumerators:

- *Be patient in listening to responses.*
- *Provide prompts to provoke a more complete response, for example:*
  - *Repeat the names of the organizations / institutions / companies already provided;*
  - *Repeat the questions again, providing the examples and/or the types of institutions (as given in question 9 above).*
- *Do not limit the responses based on the space provided below. Use an additional sheet to record more responses if necessary.*
- *In the relevant column for the response, write the number (1-5, 5 being strongest) that represents the perceived force of the relationship.*

Organization / Institution / Company	Type and strength of relationship			Contact Information ***Note: This information is for the snowball approach. Only ask for contact information once the respondent has completed the three questions, and only for organizations for which we do not already have contact information.***
	1. Product / Service Provision	**2. Collaboration**	**3. Information / Learning**	

** Enumerator probes, repeating all the listed organizations and asking for any additional*

5. Please list the organizations / institutions / companies that support workforce development with which your organization has NOT had any relationship, but you would like to establish a relationship of any type.

#	Organization / Institution / Company