Analyzing Moroccan Employment Stakeholder perceptions using Social Network Analysis & Text Analysis

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Abstract. Stakeholder analysis allows us to identify relevant actors that can make reforms in a specific context. Moreover, many studies suggest the involvement of different stakeholders in the process of solving complex problems and recommend creating close collaborations between stakeholders. However, the stakeholders' different perceptions and goals can create conflicts between stakeholders that block developing collaborations and policy reforms.
In this paper, we apply a new methodology for stakeholder perceptions analysis. Instead of using surveys we use Network Text Analysis (NTA) on reports collected from employment stakeholders' websites in Morocco. Using NTA helps us identify the stakeholders working on the problems related to education and employment. In addition, we use Social Network Analysis (SNA) to analyze stakeholders sharing the same perceptions and goals. Our results reveal that the perceptions of universities and the private sector are very different. We also find that organizations that aim at promoting employability share common perceptions since they have similar goals.

Keywords: Network Text Analysis · Meta-Matrix Text Analysis · Stakeholder perception · Employment Stakeholders· Social network analysis

1 Introduction

Stakeholder analysis allows us to identify and analyze the actors that can be involved in influencing a policy reform in a specific context through their position or their resources. These actors represent different parties and each party has different perceptions and goals that influence their actions [1]. Unfortunately, this difference of perceptions can create conflicts between stakeholders and groups that may affect the process of developing collaborations and policy reforms [1, 2] since stakeholders need to share common goals and knowledge in order to ensure a strong collaboration [3]. In Morocco, the problem of unemployment is considered a complex and challenging problem that requires the involvement of different stakeholders [2, 4]. Indeed, studies in this field found that there is

a lack of collaboration between employment stakeholders and that it may be due to mistrust or the difference between stakeholders' perceptions and goals [5]. However, prior work mostly overlooks analyzing employment stakeholders' perceptions in countries that struggle with unemployment.

In this paper, we use a novel approach to analyze employment stakeholders' perceptions in Morocco where the unemployment rate of graduates is more than 23% [6] and the exchange of information about the job market between employment stakeholders is weak [5]. We adapted a social network technique, Network Text Analysis (NTA) in order to extract networks from the text, and applied it to a novel data set that contains reports collected from employment stakeholders websites. 102 representatives of different employment stakeholders are used in this analysis, but only 50 of them were included in the data collection process since the others didn't publish reports. Finally, using SNA two main objectives are of interest of this study: 1) identify the stakeholders working on education and employment by mapping the stakeholders and the identified topics 2) identify the stakeholders sharing the same perceptions and goals using SNA measures.

Our results reveal that stakeholders' perceptions proved to be different according to the stakeholder area of expertise and goals. For instance, universities focused only on education and are not interested in employment. On the other hand, we found that the organizations that aim at promoting employability such as ANAPEC, EFE and USAID share common perceptions since they have similar goals. Such findings can be used by policymakers who can bring stakeholders sharing the same perceptions to work together to obtain better results.

2 Related Work

Research on stakeholder's perceptions is very useful in analyzing the collaboration between stakeholders and its impact on the relationship among them[1, 7]. But existing research has been limited to survey studies on specific stakeholder groups. Regarding the reason behind using stakeholders' perception, the Swiss agency for development [1] cites that stakeholders have different goals and perceptions that control their actions and that by analyzing stakeholders' perceptions we can identify the different parties that can make a reform in a specific context. Byrd et al [7] found that a difference between stakeholders' perceptions in tourism can create conflicts between stakeholders groups. Concerning the applications of stakeholders' perceptions, Erika et al. [2] identified stakeholder perception about the Brownfield regeneration in Europe using surveys filled by stakeholders from five countries. This paper reports that stakeholders' perceptions differ according to the country. The author also created a knowledge base that can be used on future projects related to brownfield regeneration. For the protected areas, several studies have used stakeholders' perceptions to identify the stakeholders affected and the degree of their influence [8, 9]. That prior work, however, does not study the employment stakeholders' perceptions. In this pa-

per, we fill this gap using a new methodology that is based on NTA instead of using surveys that are costly in terms of time and resources.

3 Methodology

The proposed methodology for analyzing employment stakeholders' perceptions consists of four phases: 1) stakeholder identification and data collection; 2) Network Text Analysis Setup; 3) text analysis and 4) data visualization. The following sub-sections describe each phase of our methodology. A similar methodology has been successfully used and evaluated in other contexts where research suggested that it can be adapted to different areas [10–12]. For instance, it was used to detect the heterogeneity in electronic data sources by applying semantic network analysis [11] and was also used to examine the impact of national culture on organizational culture by analyzing reports generated by companies [12].

3.1 Stakeholders and data collection

Key stakeholders were identified through meetings in the form of focus groups between the USAID career center and the main employment stakeholders in three main regions in Morocco (Tangier, Casablanca and Marrakech). 102 stakeholders from this previous study [5] were used in this study because they are also related to our problem on employment. Of these stakeholders, we reduced to 50 to only represent those stakeholders who submit reports. These stakeholders belong to 10 different categories which are the private sector, public sector, youth, universities, recruitment agencies, vocational schools, funders, civil societies and finally the Media. The full list of stakeholders is given in the appendix (The appendix is available upon request).

Our data was collected using two methods; first, we used stakeholders' websites to collect their reports. Then, we used scripts developed with Python to scrape two main important online newspapers(Le Matin, La Vie eco) in Morocco using keywords (such as stakeholders names and topics related to employment). We focused on articles published between 2010 and 2018. Finally, we ended with 565 French newspapers and reports in PDF and text format.

3.2 Network Text Analysis Setup

To analyze this textual data, we used Netmapper [13], which is a tool that combines Network Text Analysis (NTA) and Meta-Matrix approach. Netmapper allows us to extract textual networks and the relationship between the nodes that compose the network [10] from the text. To apply this tool for stakeholder analysis, we needed our data in text format, a delete list that contains concepts that we don't need and finally a meta-matrix thesaurus that contains the concepts used in the text.

Data pre-processing We first start by converting the PDF files to text format using Textcleanr [14]. Following this step, we built a delete list[15], which removes concepts such as conjunctions and articles from the text. This delete list reduced our list of concepts by 39%, which allow us to focus on relevant concepts to our research question. Next, we used a French Named Entity Recognizer(NER) [16, 17] to extract proper names and abbreviations from the text that are going to be used for the thesaurus creation.

Thesaurus creation We built our own meta-matrix thesaurus due to a lack of French thesaurus related to employment and education topics. The role of a thesaurus is to associates text-level concepts with higher-level concepts also called unique entities [18] in order to map the words that have the same meaning or represent the same organization. The higher-level concepts can have multiple text-levels concepts, which are the content of a data set. For instance, Peter X (the higher-level concept), an author of a paper can appear in the text as Dr. Peter or X.Peter (related text-level concepts).

To build the thesaurus, we added 1553 entries extracted using NER and assigned to them the higher-level concept. Second, we classified the concepts into entity classes of the meta-matrix [19], which are: agent, knowledge, resource, event, organization, location role and attribute (see table 5 in the appendix for examples). Third, we added the list of topics used in the texts which are concepts related to the knowledge entity in the meta-matrix. These topics were chosen to be related to employment and education. Finally, in order to avoid having a large number of knowledge entities that could result in redundancies in the network nodes, we used Word2Vec (W2V) [20] to identify the words that have the same meaning (e.g partnership, cooperation and collaboration) or the words that can represent a general topic (e.g PHP, HTML and CSS are programming languages) which helped us reduce the knowledge entity by 52%. Table 1 provides a quantitative information on the meta-matrix thesaurus. We only focused on organization and knowledge entities because our purpose is to identify the stakeholders and their perceptions.

Table 1: Meta-Matrix Thesaurus

Meta-matrix Entity	Unique # of entities analyzed	Total number of entities analyzed
Organization	737	1553
Knowledge	346	720
Location	100	314
Event	62	217

3.3 Text Analysis

To perform text analysis, we used Netmapper where we applied the meta-matrix thesaurus and the delete list to our data set. We used a sentences as the coding unit and we chose to only use the content of our thesaurus (for more information

about coding choices in Netmapper [21, 10]). Netmapper automatically extracts the identified concepts specified in the thesaurus and relate them with the higher-level concepts, and then extract the relation between them using the text. A link is placed between two concepts when we find them for the first time in the same sentence and the link width keeps increasing if the link already exists. As a result of this process, Netmapper generates a network for each text.

3.4 Data Visualization

We visualized our resulted networks using ORA [22] which is a Social Network Analysis tool. By using SNA we were able to identify the key stakeholders in each network, the topics used by stakeholders and also perform several combinations using the resulted networks to analyze the connections/similarities between stakeholders' perceptions. Finally, we added an attribute to the nodes that represent the organizations' categories (i.e private sector, public sector, university and others) in order to obtain the networks between stakeholders categories. The visualization includes only the 102 stakeholders who were initially selected in this study while the other stakeholders that were extracted using the thesaurus are hidden.

4 Results

4.1 Results by topics - Who is talking about these topics?

Our methodology allows us to identify the most important topics(knowledge entities) in our data set and also identify the stakeholders talking about these topics. For topic identification, results using topics frequency show that we had "Education and Training" in the first place with a frequency of 7359, followed by "Employment" with a frequency of 3782 and finally "Soft Skills" with a frequency of 1985. For stakeholders identification, we used the visualization of the resulted networks where the node in the center of the network represent the identified topic, the other nodes around it represent the stakeholders talking about this topic and the link width represents how many times the topic was used by the stakeholder(Table 2 contain the full name of stakeholders mentioned in the result section).

Table 2: List of Abbreviations

Abbreviation	**Full Name**	**Category**
ANAPEC	Agence nationale pour la promotion de l emploi et des competences	Public sector
CGEM	Confederation Generale des Entreprises du maroc	Private sector
UCA	University Cadi Ayaad	Universities
EFE	Education for Employment Morocco	Civil societies
ENACTUS	Club ENACTUS	Youth
USAID	United States Agency for International Development	Funders

Education and Training Figure 1 depicts a visualization of the stakeholders talking about Education and Training. In general, we can see that all the stakeholder categories are talking about this topic, which means that it is one of the main topics related to our general subject on employment. This finding was also supported by the network density value which is equal to 0.84 which means that 84% of the stakeholders are talking about this topic. But, if we look closely at the link width we see that in reality, we have only four stakeholders with strong connections, which means that the stakeholders who are really interested in this topic are ANAPEC, OFPPT, CGEM and EFE. The reasons behind these findings are that ANAPEC, OFFPT, and EFE are mainly working on giving training for youth so they can be able to work in the job market while CGEM is representing the private sector companies and have more information about the job market. Using this network we were able to identify the key stakeholders working on topics related to education and training, and if we get these stakeholders to work with each other and collaborate we can ensure a good education system and reliable training programs.

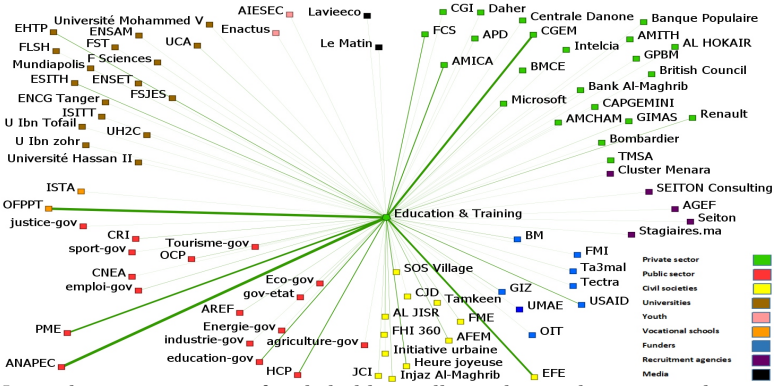

Fig. 1: Network representation of stakeholders talking about education and training (14 isolates are hidden)

Employment is another topic that should be addressed in order to have a clear idea about our problem. Figure 2 unveil which stakeholders are talking about employment. We can see that we have more connections with the stakeholders representing the private sector and that is because these stakeholders are the ones providing employment in the first place. In addition to the private sector, we can see that we have strong links between this topic and EFE, OFPPT, ANAPEC and USAID. The reason behind these links is that these stakeholders focus on giving training that are needed by the job market and try to help youth in finding employment. Surprisingly, we find very few connections between the employment topic and universities, and even the available ones are so weak. We can explain that by the fact that universities in Morocco don't have training programs adapted to the job market [23]. Unfortunately, this situation causes a high rate of unemployment and especially for graduate where it is equal to 23% [6].

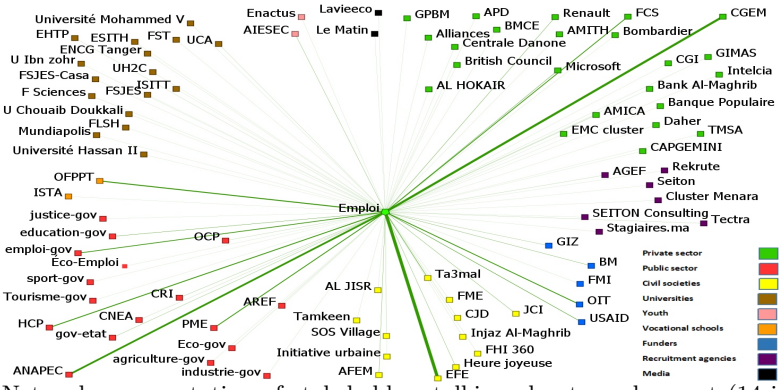

Fig. 2: Network representation of stakeholders talking about employment (14 isolates are hidden)

Soft Skills are highly required by the job market [24, 25]. There is a strong demand for soft skills compared to technical skills. In figure 3 we can see that except universities, the majority of stakeholder categories are talking about soft skills. Unfortunately, this finding hampers youth from developing the soft skills needed by the job market since one of the roles of the university is to introduce such skills in the curricula. Now unlike the other networks, we have a good presence of youth in this network. Both student organizations are talking about soft skills. This result was expected since youth in these two organizations are working on projects with associations and do volunteering which helps them gain skills such as communication skills, teamwork, creativity and others.

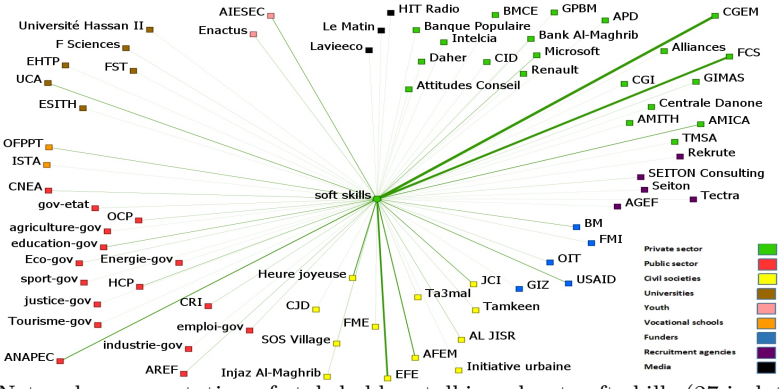

Fig. 3: Network representation of stakeholders talking about soft skills (27 isolates are hidden)

4.2 Results by stakeholder - what topics are stakeholders talking about?

Our methodology allows us to identify the most important topics(knowledge entities) in our data set and also identify the stakeholders talking about these topics. For topic identification, results using topics frequency show that we had

"Education and Training" in the first place with a frequency of 7359, followed by "Employment" with a frequency of 3782 and finally "Soft Skills" with a frequency of 1985. For stakeholders identification, we used the visualization of the resulted networks where the node in the center of the network represent the identified topic, the other nodes around it represent the stakeholders talking about this topic and the link width represents how many times the topic was used by the stakeholder(Table 2 contain the full name of stakeholders mentioned in the result section).

ANAPEC & EFE are two stakeholders respectively representing the public sector and civil societies with the goal of supporting unemployed Moroccan youth. They are using almost similar topics such as "Training", "Skills", " Employment", "Youth", "Partnership" and others (see figure 4 on ANAPEC). Moreover, we notice strong links between these topics, which means that these two stakeholders are providing training for youth so they can develop their skills and they are also looking for partnerships with other stakeholders in order to provide employment for youth. These results show the involvement of ANAPEC and EFE in solving the problems related to unemployment which was introduced in a previous study [5] where they found that ANAPEC is interested in the collaboration and the exchange of information about the job market. On the other hand, we notice no mention of the topic "Entrepreneurship". Unfortunately, this situation hampers youth from living their passion, creating innovative solutions and also creating employment for themselves and for others.

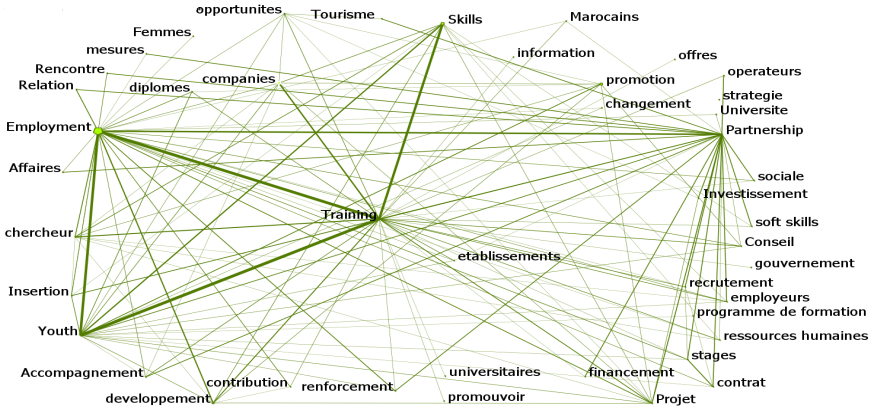

Fig. 4: Strong knowledge network of ANAPEC (weak links hidden), the size of nodes positively correlates with the frequency of the word in the texts.

CGEM is an organization that represents the private sector organizations. We found that CGEM is using a diversity of general topics such as "industry", "energy", "employment", "skills", "training" and others. Moreover, we have strong links between "measures", "industry", "training" and "skills" which means that CGEM is aware of the job market needs. We also have strong links between "innovation" and "development" which means that CGEM believes that innovation

can be a solution for some problems. Additionally, we have a strong presence of "soft skills" compared to the other skills which mean that they are highly required by the job market. From this analysis, we can say that CGEM can be a good source of information and if they start sharing them they can help universities to shape their curricula on the job market needs and also help ANAPEC and EFE to give the most appropriate training that leads to employment.

4.3 Correlation

Table 3 contains the comparison between various network correlations. We only included the stakeholders identified in the previous section and added the network "All stakeholders" that contain the union of all stakeholders' topics. Using the correlation metric we can identify the stakeholders using the same topics and sharing the same perspectives. Results reveal that we have a medium correlation between the network "all stakeholders" and ANAPEC, CGEM, EFE and USAID, and that means that these stakeholders are using an important part of the topics included in our study. This finding is similar to results found in the previous section since these stakeholders were present in all the other networks and were using a diversity of topics in their reports. Additionally, we have a medium correlation between ANAPEC and EFE and also between EFE and USAID. These results are probably due to the fact that these stakeholders are sharing common goals and perceptions which is promoting youth employment. But if we look closely at CGEM we see that we have only weak correlations which means that they have a different perception. The reason behind our focus on the private sector is that they are a good source of information and they are the ones creating employment in the first place.

Table 3: Correlation between networks. Correlation can be interpreted by following this classification: Weak correlation: v=0.10 to 0.29, Medium correlation: v=0.30 to 0.49, Strong correlation: v=0.50 to 1.0

	All stakeholders	ANAPEC	ENACTUS	CGEM	EFE	UCA	USAID
All stakeholders	1	**0.231**	0.075	**0.357**	**0.327**	**0.224**	**0.369**
ANAPEC		1	0.078	0.040	**0.322**	0.074	0.136
ENACTUS			1	0.008	0.048	0.012	0.081
CGEM				1	0.056	0.132	0.111
EFE					1	0.066	**0.381**
UCA						1	0.164
USAID							1

5 Limitations and Future Work

While this study presents a detailed methodology and analysis of employment stakeholder perceptions, there are a couple of limitations. Our analysis couldn't cover professors and education trainers' perceptions since these categories don't

publish reports. However, we believe that our study is not harmed by this situation since the policymakers responsible for education and employment are the public and private sectors. Second, collecting all the online reports was not feasible because there is a variety of resources talking about the selected stakeholders. However, in our study, we relied only on trusted sources. In our future work, we intend to automate the process of constructing the thesaurus because it requires a lot of manual work. Finally, we intend to use additional sources of data such as social media.

6 Conclusion

In this paper, we analyze employment stakeholders' perceptions in Morocco using a new methodology called Network Text analysis technique in order to identify stakeholders sharing the same perception and goals. We use textual data collected from stakeholders' websites and also collected from two main important newspapers using keywords. Then we use NTA and SNA to extract and analyze the resulted networks from the text.

Our methodology identifies the most important stakeholders working on education and employment using the strong links included in the networks and also using the number of time the stakeholder was related to our selected topics. For instance, we find that ANAPEC, EFE, CGEM, ENACTUS and USAID were at least present in three networks which reflect their interest in our problem. However, we noticed less implications of universities especially when we talk about employment and soft skills. This result was surprising since universities need to provide training and soft skills that are highly demanded by the job market and that leads to employment. Additionally, we find that stakeholders are using topics related to their area of expertise or goals. For instance, CGEM a private-sector organization that seeks for economic growth is using a diversity of topics related to information about the job market. While ANAPEC, EFE and USAID are almost sharing the same topics since they have the same goals which is helping youth for better employability. Since we find that CGEM have expert knowledge on information about the job market that the other stakeholders are lacking, policymakers can bring CGEM and the other stakeholders to collaborate between them in order to create more appropriate curricula and training and also bring stakeholders with the same goals such as ANAPEC and EFE to work together in order to obtain better results.

Finally, we believe that our methodology can be replicated on other stakeholders or other problems but will require some adjustments to the thesaurus. using NTA and SNA can be a powerful technique for stakeholder identification while doing stakeholder analysis as was proved in this paper.

7 Acknowledgement

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8 Appendix

8.1 Stakeholders networks

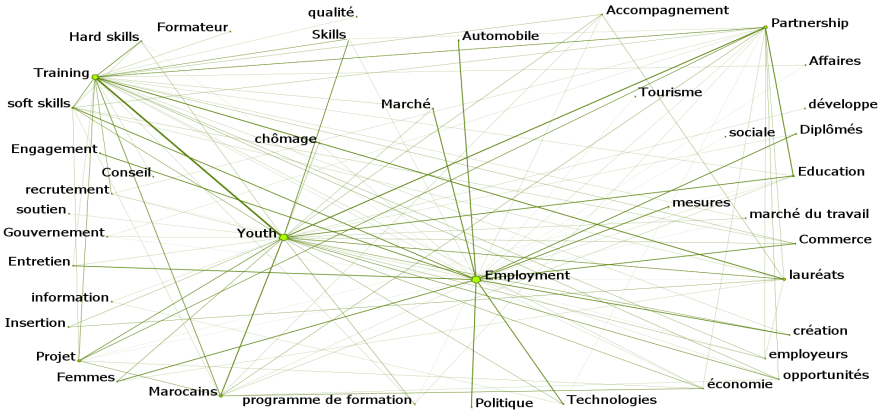

Fig. 5: Strong knowledge network of EFE (weak links hidden), the size of nodes positively correlates with the frequency of the word in the texts.

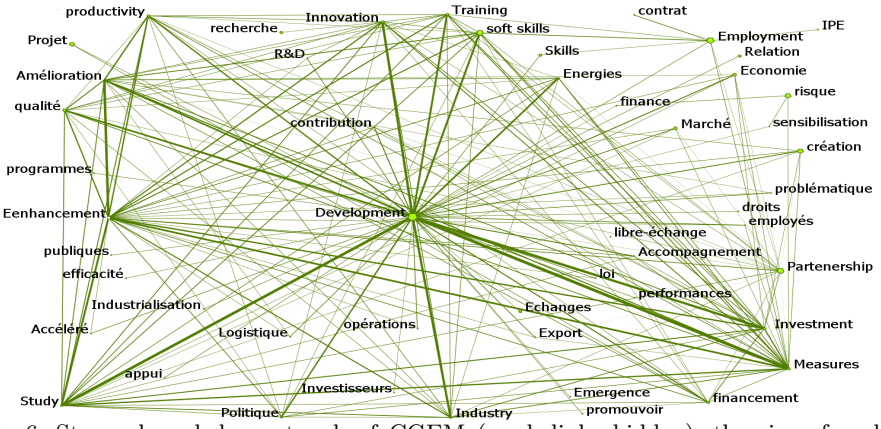

Fig. 6: Strong knowledge network of CGEM (weak links hidden), the size of nodes positively correlates with the frequency of the word in the texts.

8.2 List of stakeholders

8.3 Example of the thesaurus

Table 4: Full list of stakeholders

Abbreviation	**Full Name**	**Category**	**Included in the data collection**
Emploi-gov	Ministry of Labor and Professional Integration	Public sector	Yes
Industrie-gov	Ministry of Industry	Public sector	Yes
Education-gov	Ministry of Education	Public sector	Yes
economie-gov	Ministry of Economy and Finance	Public sector	Yes
ANRT	National Telecommunications and Regulatory Agency	Public sector	Yes
OMPIC	Moroccan industrial and commercial property office	Public sector	Yes
invest-gov	Moroccan Investment Development Agency	Public sector	Yes
PME	Small and medium enterprises	Public sector	Yes
HCP	Haut-Commissariat au plan	Public sector	Yes
ANAPEC	Agence nationale pour la promotion de l emploi et des competences	Public sector	Yes
ANPME	Agence Nationale pour la Promotion des Petites et Moyennes Entreprises	Public sector	Yes
CNEA	Comite National de l Environnement des Affaires	Public sector	Yes
FCS	FCS - CGEM	Private sector	Yes
CGEM	Confederation Generale des Entreprises du maroc	Private sector	Yes
BMCE	BMCE Bank	Private sector	Yes
BP	Banque populaire	Private sector	Yes
Deloite	Deloite	Private sector	Yes
AGRO food	AGRO food	Private sector	Yes
CAPGEMINI	CAPGEMINI	Private sector	Yes
FIMME	Fédération des Industries Métallurgiques Mécaniques	Private sector	Yes
AFEM	Association des Femmes Chefs d Entreprises du Maroc	Private sector	Yes
FST	Faculte des Sciences et Techniques	Universities	Yes
Mundiapolis	Mundiapolis	Universities	Yes
Univesity CA	University Cadi Ayaad	Universities	Yes
F sciences	Faculte des sciences juridique economique et social	Universities	Yes
Univesity abdel malek	Univesity abdel malek	Universities	Yes
OFPPT	Office de la formation professionnelle et de la promotion du travail	Vocational schools	Yes

Abbreviation	**Full Name**	**Category**	**Included in the data collection**
SOS village	SOS village	Civil societies	Yes
100% maman	Association 100% maman	Civil societies	Yes
EFE	Education for Employment Morocco	Civil societies	Yes
Heure joyeuse	Association l heure Joyeuse	Civil societies	Yes
APDM	Association Pour Le Progres Des Dirigeants, Maroc	Civil societies	Yes
FME	Moroccan fondation for youth	Civil societies	Yes
ALJISR	ALJISR	Civil societies	Yes
INJAZ	Injaz Al-Maghrib	Civil societies	Yes
JCI	Jeune Chambre Internationale	Civil societies	Yes
ENACTUS	Club ENACTUS	Youth	Yes
AIESEC	Association des Etudiants en Sciences Economiques et Commerciales	Youth	Yes
TECTRA	TECTRA	Recruitment agencies	Yes
Rekrute	Rekrute	Recruitment agencies	Yes
Seiton	Seiton Conslting	Recruitment agencies	Yes
GIZ	Cooperation Allemande	Funders	Yes
USAID	USAID	Funders	Yes
OIT	OIT youth at work	Funders	Yes
La vie eco	La vie eco	Media	Yes
IYF	International youth foundation	Funders	Yes
Le matin	Le matin	Media	Yes
Chambre regionale agriculture	Chambre regionale agriculture	Public sector	No
Conseil Regional	Conseil Regional	Public sector	No
Conseil Regional	Conseil Regional	Public sector	No
DRFP	DRFP	Public sector	No
Radisson Blu	Radisson Blu	Private sector	No
CGI	CGI	Private sector	No
ADRHZF	Association des DRH de La Zone franche	Private sector	No
CCIS	Chambre de Commerce d Industrie et des services	Private sector	No
Daher	Daher	Private sector	No
Hotel Farah	Hotel Farah	Private sector	No
SEBN Maroc	SEBN Maroc	Private sector	No
ENSA	Ecoles Nationales des Sciences Appliquees	Universities	No
ISITH	Ecole Superieure des Industries du Textile et Habillement	Universities	No

Abbreviation	**Full Name**	**Category**	**Included in the data collection**
ENCG	Ecole Nationale de Commerce et de Gestion	Universities	No
Info Design	Info Design	Vocational schools	No
Visa School	Visa School	Vocational schools	No
Casal Dels Infants	Casal Dels Infants	Civil societies	No
MCISE	Centre Marocain pour l Innovation et l Entrepreneuriat Social	Civil societies	No
Tamkeen	Tamkeen	Civil societies	No
Association Initiative Citoyenne	Association Initiative Citoyenne	Civil societies	No
Cluster Menara	Cluster Menara	Civil societies	No
Marrakech Generation	Marrakech Generation	Civil societies	No
RADD	Reseau Africain pour le Developpement Durable	Civil societies	No
Irchad Attalib	Irchad Attalib	Recruitment agencies	No
OBI Conseil	OBI Conseil	Recruitment agencies	No
Focus Consulting	Focus Consulting	Recruitment agencies	No
PONT RH	PONT RH	Recruitment agencies	No
British Council	British Council	Funders	No
Cooperation Canadienne	Cooperation Canadienne	Funders	No
Attitudes Conseil	Attitudes Conseil	Funders	No
Cummins TEC	Cummins TEC	Funders	No
Ta3mal	Ta3mal	Funders	No

Table 5: Example of meta-matrix thesaurus (some columns are not shown in this example)

Concept From	ConceptTo	MetaOntology
Agence nationale de promotion de l'emploi et des compétences	ANAPEC	Organization
Abdelmounaim Madani	ANAPEC	Organization
ANAPEC	ANAPEC	Organization
éducation	Education	Knowledge
Education	Education	Knowledge