Evaluating critical success factors for implementing renewable energy strategies in the Dominican Republic

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Abstract: Global awareness and commitment, in regards to climate change, access to water and renewable energy deployment has risen in the last decade. However, many countries are still locked in unsustainable practices, specifically in regards to energy, this results in damaging consequences not just for the country but the world. Case in point of the Dominican Republic (DR), an island with an immense renewable energy potential, a growing economy and the financial aid of many international entities. Regardless of all this, "the business as usual" decision for the energy strategies is based on fossil foil. As a result, thousands of people are still without energy, the infrastructure itself is unreliable, and the cost of fossil fuel is 6-8% of the country's GDP. The country also suffers from blackouts, the expensive tariff and unstable energy grid. Therefore, this paper discusses and critically evaluates critical success factors (CSF) for implementing renewable energy strategies in the DR. For this purpose, an extensive literature review was done, along with 25 interviews with the key actors in the renewable energy market of the DR, that were analysed using content analysis and ISM method. These methods provided insight into 6 CSF. These CFS aid the stakeholder's in the creation and growth of the RE market in the DR.

Keywords: Critical success factors, Sustainable goals, successful implementation of renewable energy projects.

Acronyms:
DR: Dominican Republic
CSF: Critical Success Factors
ISM: Interpretive Structural Modelling
GDP: Gross Domestic Product
CO2: Carbon Dioxide
RE: Renewable Energy
IRENA: International Renewable Energy Agency
USD: United States Dollar
GWh: Gigawatt Hour
MW: Megawatt
GHI: Global Horizontal Irradiance
KPI: Key Performance Indicators
PPA: Power Purchase Agreement

1. Introduction

Behavioural changes, as well as an increase in renewable energy knowledge and investment, are the key to enhancing the adoption of more sustainable practices worldwide. However, this increase is detained by unsustainable practices, especially in the energy area. As many developing countries (Low-middle economy countries) are still locked in outdated and environmentally unfriendly energy method of fossil fuel for power generation; Case in point of the Dominican Republic (DR), a country with high sustainable goals yet it has locked its energy sector on fossil fuel (Konold *et al* 2015). Despite the fact, that the fossil fuel energy generates several critical issues to the nation: Fossil fuel imports are susceptible to the unstable oil prices, and with around 85% of the energy in the country coming from Fossil fuel, this results in a high cost to the country with approximately 6-8% of the GDP, making the countries trade market unbalanced and contributing to the pollution and global climate change, which of the region the DR is the greatest CO2 polluter (Guerrero-Liquet *et al*, 2016). In addition, the energy sector in the DR suffers from blackouts due to inadequacy of fossil fuel power generating plants and high cost of the tariff along with technical and non-technical issues that have plague the country for years. The paradoxical matter is that the DR has a renewable energy potential to not only supply its energy demand but to aid in supplying energy to neighbouring countries (NREL, 2001; BID, 2013 and IRENA, 2016).

DR faces challenges related to three specific areas: Government, Private sector and the end user. Better coordination between the involved actors would result in a successful implementation of renewable energy strategies. For this coordination and implementation, is where Critical Success Factors (CSFs) should be used.

CSFs are an x-number of the main areas where an organisation, institution, department, project and so on, must achieve an efficient performance to realise its mission, vision and goals. CSFs can be derived from a literature and organisational document review. However, Parker (2010) defines CSFs as an information analysis to a project's (Organization, Institution and more) ability to exploit its strengths and weaknesses, therefore implying an interlinking of the CSFs and the current strengths and the current barriers of the project. Also, CSFs provide a vital instrument for measuring the performance goals of a project. Also, CSFs can be obtained from the analysis of interviews with the principal management personnel about their specific position (business or project related) and the barriers encountered in reaching the goals and objectives of the specific project, department or organisation that the interviewers belong. It is a combination of this two methods that this paper is based on. CSFs indirectly affect the renewable energy strategies, as their effect is on assertion of goals of the project and as a way to enable success of the project mission. CSFs will also aid in increasing efficiency of generation, transmission, and distribution of renewable energy (RE) in the power sector of the DR. This transformation to RE must be an essential priority in the country.

In this evolving environment characterised by increasing electricity demand, the pipeline of new power generation projects is key for the sustainability of not just the country but of the world. The foremost objective of the research is to find and fill potential gaps in the existing research that might result in conclusions that will formulate an efficient CSFs and ultimately a framework for the successful implementation of renewables. This paper provides a landscape of main energy resources in the DR. Section four is focussed on the methodology. While section two presents the description of the case study of DR with its sustainable goals and renewable energy potential. Furthermore, section four focuses on CSFs in a general manner and the un-unique and unique CSFs for DR. Finally section five contains the conclusions that have been reached after the analysis.

2. Outlook of the energy landscape of the Dominican Republic

DR is one of the largest islands in the Caribbean and possesses one of the most diverse and fastest growing economies in the region. Also, its energy consumption is increasing rapidly, at an average of 1% per year. However, the country relies heavily on fossil fuel, which needs to be imported and accounts for nearly 82% of the energy generated and supplied; at present fossil fuel represents 6% to 8% of the annual GDP (6,722.22 USD per capita) spent, this is not considering the 2% that represents the energy subsidies that the government injects into the electricity tariff to stabilised the rates for consumers (IRENA, 2016). Contradictory, DR also has one of the highest renewable energy potential in the region (66% of energy capacity approximately 1.44

gigawatts just on on-shore wind and hydro power) (Konold *et al*, 2015). However, despite all the challenges the DR has committed to several sustainable goals, shown in Table 1.

Table 1: Sustainable goals of the DR
Source: IRENA (2016)

Sl. No	Sustainable Energy Goals of the DR
1.	Reduction of Greenhouse Gas emissions by 25% by 2030
2.	Reduce fossil fuel import dependency
3.	Reduce the local and global impacts of fossil fuel combustion on the environment
4.	Increase renewable energy in the power generation mix by 25% by 2025 (Law 57-072)
5.	Rural Electrification program with off-grid renewable projects
6.	Blackout reduction programme

In regards, to the first sustainable goal the Dominican Republic has the highest CO2 emissions of not only the Caribbean region but of several Latin American countries. Such as a 0.79 gigatons per GWh in 2002 and 0.81 gigatons per GWh in 2011, having a 0.2% increase per unit of generated electricity, according to the REN21 report in 2018.

The energy strategies are key for increasing the share of renewables and achieving all sustainable goals. The majority of power generation plants in the DR are primarily based on hydrocarbons, and this fossil fuel plants are very inefficient**.** On average in DR the efficiency of fuel oil generation in 26.6% and coal steam is 28% this is extremely low and inefficient. However, the energy market is still working under the obsolete hydrocarbon law. (Konold *et al.* 2015)

In recent years the energy sector in DR has been flourishing in renewable energy projects. However, very few of these projects are realised. In addition, the sector, and specifically the law 57-072 that rules renewable energy along with the Energy Distribution law, have gone through a series of reforms to ensure, secure and low cost of electricity supply to consumers. These reforms have introduced policies such as cut to the tax incentives, which the law 57-072 initially had, by more than half, along with the feed in tariff energy method established. These new policies have reduced the investment and interest in renewables (IRENA, 2016).

Apart from the legal challenges DR faces technical and non-technical issues, especially with the grid. Some of the issues are: (a) very high distribution losses at approximately 32% in 2014. (b) Subsidise electricity prices by the government (1 Billion USD annually), which results in an inadequate investment of funds, cutting of the investment into grid capacity upgrades. This lack of grid optimisation leads to hours of long blackouts. Among the non-technical challenges, the major one is electricity theft as it is not adequately addressed because of the limited regulatory capacity and implementation. Also the fear of threats from the population illegally connected. These non-technical issues account for approximately 12% of the DR electricity losses. Other technical issues are (a) inefficiencies at generation plants and substations, (b) inefficient and overloaded transmission lines. These technical and non-technical challenges contribute roughly to a loss of around 100 million USD annually (Konold *et al* 2015) in the electricity sector's creating a deficit for the country and government.

The DR possesses a strong RE potential in wind, solar and hydro sources, according to studies by the National Renewable Energy Laboratory (NREL) (2001) and the World Watch Institute (2015). This potential has a wide country range and can meet almost completely the current power demand according to projections by IRENA in 2016. Regarding local wind potential, the DR possess from 100-10000 MW with approximately 79 potential areas of high winds. In solar the DR shows incredible solar potential with a GHI that ranges from 5 to 7 kilowatt-hours per square meter per day (kWh/m2 /day) throughout most of the country and approaches eight kWh/m2 /day in some regions. The hydropower in the DR is almost at maximum capacity, as already 90% of the water sources have been utilises, meaning that any new hydropower plant would impact on a minimal scale the energy supply and demands. Also, the hydropower plants in existence only operate for short hours (4-6) a day because of water regulations that prioritise water for drinking, agriculture and then electricity. Regardless of this, the government continues to invest greatly in the area (1.6Billion USD from 2010-2015).

The Future Expansion of the electricity capacity in the DR has been planned since 2012 with the proposed addition of 2,069.5MW of energy by 2018. However of this 2,069.5MW renewable energy (RE) only represents 219MW around 10.58% of the whole energy expansion (IRENA 2016 and Konold *et al.* 2015). This is an example of unsustainable practices and thinking of the government; with the current approval and construction of the Punta Catalina Power Central that shall be coal generated, the government has efficiently locked the energy market in the DR into a fuel dependency that might probably raise the cost of electricity for consumers thus disregarding the energy goals that have been set.

The country has significant additional renewable energy potential to go beyond the projected 66%. However, for the country to reach 66% and beyond a restructuring of the current strategies is needed. The first step is to study the projects that have been implemented successfully in the DR and analyse the CSFs, to guide the country into a more sustainable future.

3. Critical Success Factors

As stated CSFs are a limited and defined a number of fields that, if implemented correctly, will ensure a successful completion of the goals and mission of the organisation or project (Parker, 2010). Many researchers (Baharuddin *et al*., 2008; Esteves, 2005; and Hsiang-Yung, 2012) defined these factors as key subjects where measures and tasks must be correctly implemented to ensure favourable results, this area is essential if the goals of the project are to be achieved. These particular areas must receive continuous and meticulous attention.

Hsiang-Yung (2012) focused their research at the renewable industry level and proposed that CSFs be common across the organisations within the energy sector. This CSFs are non-unique at an industry-level, this means that these particular factors are relevant for any company in the renewable energy project. However, Parker (2010) explains that CSFs might differ from project to project depending on the hierarchy of the CSFs. This would re-established concepts from 1979 of CSFs and would reintroduce the notions of managerial-level CSFs and organisationally unique CSFs. A thorough discussion of several researchers (Parker, 2010, Esteves, 2008 and Bahariddin *et al*. 2008) the tiered nature of CSFs, can be divided into four specific levels: industry, organisational, department, and individual. Now, this classification is based on the industry or environment analysed. Stainforth and Staunton (1996) restore five different levels of CSFs based on the different departments or roles in a project and how each contributes to achieving the mission of the project: (a)the structure of the specific project (industry/project CSFs) (b) competitive approach, project importance, and physical location (strategy/approach CSFs) (c) the current social-political-economical-technological-climate change environment (environmental CSFs) (d) challenges/barriers to implementing the project (temporal CSFs) leadership and knowledge management (management CSFs).

A renewable project CSFs may contain any or all of these types. Analysing and understanding the different types of CSF helps the projects professional recognise whether the CSFs are common or unique and how they may continue or evolve; no organisation can manage to create and implement a strategy that does not provide acceptable care to the primary factors which are the cause of success in the project.

As Stainforth and Staunton (1996) described the CSFs for implementing renewable technologies, however, the focus of their research, was on simply implementing the technology and did not take into account the challenges and drivers needed for the whole project. In this paper, the focus has been on the entire project and its key actors in DR specifically, as this country is usually used as a testing ground for companies, since it is one of the largest and fastest growing economies, investors and organizations will usually set the base of operations in the country or do a trial and error of the projects in country. The thought behind this is that if it works in the DR, it will work for the rest of the region. In this way, the DR becomes a mirror of the area.

In the case of the DR, after conducting the interview's and analysing the data the key CSFs were determined as can be seen in Table 2.

Table 2: CSFs for implementing RE business strategies in the DR

Code	CSFs	Percentage of interviewees Cited (N=25)	Possible Measures
F4	Creation of financial tools for renewable energy projects	84%	Reports on: RE loans, Incentives, Cooperatives, Interest rates
F3	Coordination between the different stakeholders	80%	Knowledge management reports and logs
F5	Knowledge creation and exploitation related to RE business	75%	RE education and training, RE higher education curriculum
F2	Implementation of the legal Framework	72%	Implementation committee, Surveys, incentives tracker, disclosure of incentives reports
F1	Update and provide access to the grid	64%	Reports on rate of change of energy line connections and private connection forms
F6	Transparency in the legal and financial tools available	60%	Reports and logs of open source publications of documentations, public auctions of agreements

4. Research Methodology

Given the complexity of renewable energy (RE) issues and the scarcity of comparable research in the area in the Dominican Republic (12 documents exist of renewable energy in the Dominican Republic, 11 of which are reports from local and international agencies and one journal) a qualitative research methodology has been adopted. As Willis (2008) explains the qualitative research will aid in understanding the underlying drivers, challenges and knowledge of renewables in the DR. The data utilised in this study is based on current scientific literature review, project documentation, and interviews with the principal actors of the renewable energy in the DR. A CSFs analysis has been conducted; with the purpose, to identify the key areas unique and un-unique to successfully implement a renewable energy project in the DR. In order to obtain a profound understanding of the current situation and challenges in the DR. Esteves (2005), Ali *et al.* (2008), Parker (2010) and Hsiang-Yung (2012), have described CSFs analysis can be carried out based solely on literature and documentation review or on interviews; as CSFs are a number(s) of key areas that define the performance and success of a project. It is imperative to understand the characteristics of CSFs; some of the key features are: CSF hierarchy, types, uniqueness, and stability over time. For this research, a focus on the kinds and uniqueness has been done.

The fact that the decisions for the energy infrastructure need to be decisive for a country to developed RE as this involves difficult trade-offs, it was critical to gather the most current and high-quality data. As Winchester and Salji (2016) explain the use of the literature review is an essential tool for the summarising of the current knowledge by also including the analysis and synthesis of empirical cases studies. For that purpose and in-depth literature review of current research in the area has been done on DR along with the successful implementation of renewable energy projects in the country, as to survey, synthesises and critically analyses the information. This method of collection will ensure that the scope of research will add, and not duplicate any previous research in different areas of DR renewable energy sector and the Caribbean region. These documents were used as relevant references for the research and provided vital information about various areas of the RE situation in DR; however, a comprehensive overview of the different stakeholders, business perspective and PESTLE (Political-Economic-Social-Technological-Legal-Environmental) analysis regarding the energy strategies in the country was lacking.

Primary data was collected through Semi-structured interviews, and purposive sampling technique was used to select interviewees. This technique was chosen as the quantity of knowledgeable personnel in the area of renewable in the DR is very limited, for this very reason the identities of the interviewees have been coded as Energy interview # (EI#), to comply with the anonymity that was agreed upon, as can be seen in Table 3, along with a summarised profile shown in Table 4.

Table 3: Classification of Interviewees for CSFs for the implementation of RE projects in DR.

Participants	**No. of interviewees**
CEO’s	7
Directors	11
Managers	7
Total	**25**

The interviews were conducted in a face-to-face format lasting on average 35 minutes. A total of 25 professionals were interviewed from the private, public and government areas of the renewable energy sector in the DR. All the interviews were transcribed verbatim.

Table 4: Description of critical criteria of interviewees.

Interviews	**Detail Desired Criteria**
Senior Experts Representatives	● Experience in the RE area (Technological, generation, Legal, financial, public and private sector) ● Knowledge in RE subjects ● At least five years of experience in RE area

For this research to make feasible proposals for assertive actions, it was imperative to understand the drivers, challenges and CSFs of all stakeholders governmental and nongovernmental that are critical in transforming the energy sector to RE as a reality. The semi-structured questions were created, to provide the interviewer with time to explain or explore particular areas, to procure in-depth information of the CSF from the main actors. The interviews were recorded, transcribed and supplemented with field notes as appropriate. The unit of analysis adopted for this study was the energy industry, and the embedded unit of assessment was the 'individual employee'.

Once the data was collected analysis of such data was carried out. Of all the possible CSFs obtaining from the primary and secondary data, the essential CSF's where identified. Once the CSFs where identity, the need to introduce them into the project hierarchy, shown in Figure. 1. The purpose of CSFs is not just to be identified but to introduce into the project and methods on how to measure the key performance indicators (KPIs) during the life cycle of the RE project.

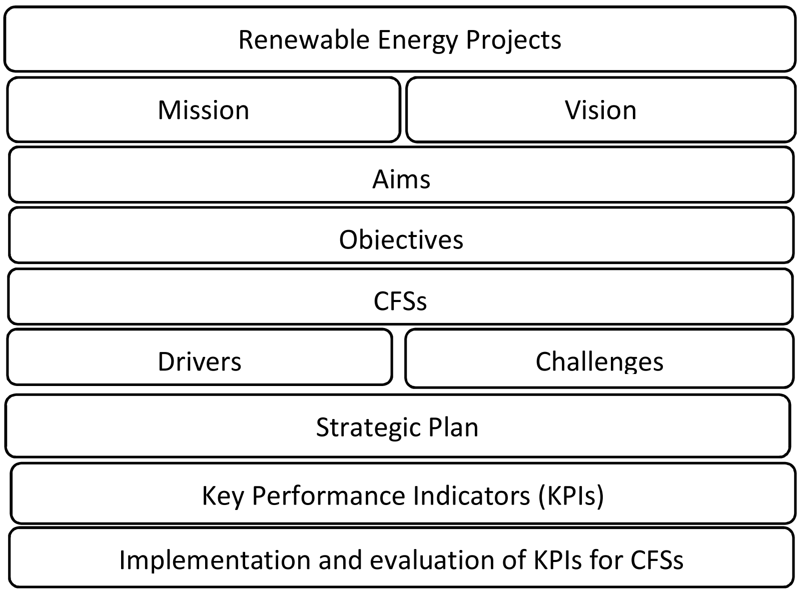

Figure 1: Renewable Energy Project Process.

Source: Parmenter (2008), Esteves (2005) and Parker (2010).

The RE potential benefits, in a financial, environmental and social aspects for the DR provoke the question of why sustainable practices, especially RE, have not become the business as usual for the country.

5. ISM analysis

Interpretive Structural Modelling (ISM) is a tested and proven methodology to understand and design the structure of a complex problem. It is a tool which is used to establish relationship between the variables affecting an issue or a problem. Identification of the factors acting as a obstacles through literature review and expert opinion, development of contextual relationship between the variables, development of structural self-interaction matrix (SSIM) then formation of reachability matrix, partition of reachability matrix into different levels, graphical representation of relationship developed among the factors explained in reachability matrix, check for inconsistencies and subsequent modification are the main steps which that are followed in ISM (Sushil, 2012).

5.1. SSIM Matrix

Experts from the industry and academia are consulted in identifying the nature of contextual relationship among the factors. The following four symbols are used to denote the direction of relationship between two factors (i and j): (a)V if factor i will influence factor j (b) A if factor j will influence factor i (c) X if factors i and j will influence each other (d) O if factors i and j are unrelated. However, only half the table is filled as the other half is a mirror of the filled half and it is not filled as to be able to create the reachability matrix. Table 5 shows the list of CSFs' while Table 6 shows the SSIM matrix developed for factors influence.

Table 5. ISM coding of CFS

Coding	Critical Success Factors
F1	Access to the Grid
F2	Implementation of the legal framework for RE
F3	Coordination and communication
F4	Financial tools for RE projects
F5	Knowledge Creation and Exploitation
F6	Transparency

Table 6. SSIM Matrix

i/j	F1	F2	F3	F4	F5	F6
F1	-	A	A	X	V	A
F2	-	-	X	X	X	X
F3	-	-	-	V	X	V
F4	-	-	-	-	X	A
F5	-	-	-	-	-	A
F6	-	-	-	-	-	-

5.2. Reachability matrix

The reachability matrix is created from the SSIM. Symbols V, A, X or O of the SSIM are replaced by 1s or 0s to create reachability matrix. Following rules are followed: (a) If the (i, j) position of SSIM is V, then the (i, j) position of the reachability matrix becomes 1 and the (j, i) position becomes 0. (b) If the (i, j) position of the SSIM is A, then the (i, j) position of the reachability matrix becomes 0 and the (j, i) position becomes 1. (c) If the (i, j) position of SSIM is X, then the (i, j) position of the reachability matrix becomes 1 and the (j, i) position becomes 1. (d) If the (i, j) position of the SSIM is O, then the (i, j) position of the reachability matrix becomes 0 and the (j, i) position becomes 0. For example: cell F1-F2 of the SSIM matrix (F1 denoting the row and F2 denoting the Column) has the letter A therefore the number denoted in the reachability matrix is 0 at the same time because of the same letter A in position F1-F2 of the SSIM matrix the reverse position F2-F1 is filled with the number 1. However, the positions F1-F1, F2-F2 and so forward are always filled with the number 1 (Attri, Dev, and Sharma. 2013 and Sushil. 2012) Table 7 shows the reachability matrix obtained from SSIM.

Table 7. Reachability Matrix

i/j	F1	F2	F3	F4	F5	F6
F1	1	0	0	1	1	0
F2	1	1	1	1	1	1
F3	1	1	1	1	1	1
F4	1	1	0	1	1	0
F5	0	1	1	1	1	0
F6	1	1	0	1	1	1

5.3. Final Reachability Matrix

The final reachability matrix (see Table 8) was computed by incorporating the transitivity in Table 7. Transitivity means the contextual relation in which if variable A is related to B and B is related to C, then A will be necessarily related to C. The transitivity measurement was computed by conducting a power iteration analysis. Since there was no transitivity effect in the context of this research, transitivity entry does not exist in matrix.

Table 8. Final Reachability Matrix

i/j	F1	F2	F3	F4	F5	F6
F1	1	0	0	1	1	0
F2	1	1	1	1	1	1
F3	1	1	1	1	1	1
F4	1	1	0	1	1	0
F5	0	1	1	1	1	0
F6	1	1	0	1	1	1

5.4. Level partitions

With the help of the reachability matrix the reachability set, and antecedent sets are generated for each factor. The reachability sets are the factors that on the row for the selected factor possess the number 1 in the reachability matrix; example: on row F1 the only factors with a value of 1 are factors F1, F4 and F5, this become the reachability set for F1 as 1,4 and5. For the antecedents sets the same is true as the reachability, however, the values are taken from the column instead of the row. For example, for column F1 the cells that have a value of 1 are F1, F2, F3, F4 and F6, therefore the antecedents of factor F1 are 1,2,3,4 and 6. The reachability set contain the factor itself and the factors which influence it, whereas the antecedent set contain the factor itself and the other factors which impact it. The intersection set for each factor contain the common factors between the reachability set and antecedent set. A factor is put on the top level if reachability and intersection sets are the same, meaning level 1, there after depending on the number of factors in common between the reachability set and the intersection set the different levels are created (Attri, Dev and Sharma, 2013 and Sushil, 2012). Table 9 shows reachability set, antecedent set, intersection set and level.

Table 9. Level of Partitions

	Reachability set	Antecedent sets	Intersection set	Level
F1	1,4,5	1,2,3,4,6	1,4	2
F2	1,2,3,4,5,6	2,3,4,5,6	2,3,4,5,6	3
F3	1,2,3,4,5,6	2,3,5	2,3,5	4
F4	1,2,4,5	1,2,3,4,5,6	1,2,4,5	1
F5	2,3,4,5	1,2,3,4,5,6	2,3,4,5	1
F6	1,2,4,5,6	2,3,6	2,6	3

5.5. ISM based Model

ISM model is developed with the help of level partition table and digraph. A digraph is the graphical representation of the factors and their interdependence in the form of nodes and edges and it is drawn with the help of level partition table. Finally, digraph is changed to ISM model by substituting nodes of the factors with statements (Attri, Dev and Sharma, 2013 and Sushil, 2012). Figure 2 shows the ISM based model. The model is read from the lower level (in this case level 4 transparency) to the highest level. In an ISM model the lower level is the most important as this is the level that creates the environment for the other factors to appear.

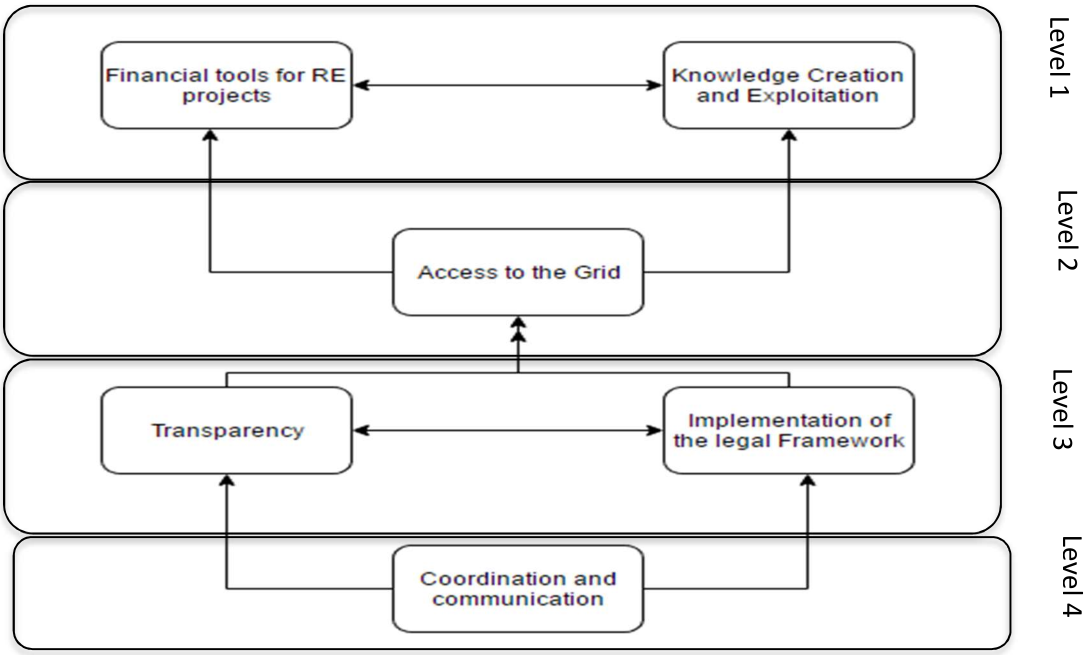

Figure2. *ISM model of CFS for DR.*

6. Discussion

The critical success factors for renewable energy projects represent a gap for the Dominican Republic's literature as the reports and journal focus on challenges and drivers yet have no mention of the CSF. In contrast, the interviews highlighted 6 CSF for the DR's renewable energy projects, organized on Table 5. However, these six CSF: (1) Access to the grid, (2) Implementation of the legal framework, (3) Coordination and Communication (4) financial tools for RE projects, (5) Knowledge creation and exploitation and (6) transparency; in order to understand the manner in which this factor interact an ISM analysis was performed with a group of experts in the area of renewables for the Dominican Republic. This analysis took into consideration how the factors interacted and affected each other or not. Table 6 shows that all the factors interacted with each other in different manners, for example: The row for F1, the first cell is denoted by a dash (-) as the factor does not interact with itself, the second and third cell possess an A as factors F2 (implementation of the legal framework) and F3 (coordination and communication) will affect, modify or impact F1 (access to the grid), while F1 will not affect either one. Once the impacts that the different factors have on each other Table 7 is created following the steps of the reachability matrix. The importance of Table 7 is the ability to create Table 8- Levels of partition, as this table will demonstrate which factor or factors are the most important based on their interaction with one another. In ISM the lowest level is the most important as it shows the most influential factor or factors. As a result of this analysis Table 9 shows that the most important factor is coordination and communication, as this factor will affect the environment and the transparency of the nation, government or company. This impact on transparency will affect the access to the grid and the implementation of the legal framework and finally this repercussion will show on the financial tools and knowledge creation and exploitation.

The results from the ISM (Table 8 and Figure 2) and the interviews (Table 2) contradict each other as the interviews placed more value on the creation of financial tools (84% of interviewees). However, the coordination and communication (80% of interviewees) of the renewable energy environment in DR was a close second in the interviews. Also, the ISM shows (see Table 8 and Figure2) that coordination and communication is actually the most important factor as it will create, modify and affect all the other factors.

7. Conclusions and Recommendations

It can be deduced from the research each CSFs augments the possibilities of success. However, this is not a 100% guarantee that the project will, in fact, succeed there are cases where the project have failed, and on the contrary, others have succeeded. The important pieces of any project that must be taken into account, is the identification of the CSFs, and measures for them that have been correctly implemented properly to achieve a higher possibility of success.

CSFs reveal areas that must be monitored over time. In the case of the DR these areas are:

- Correct implementation of the legal Framework, as 72% of the key actors highlighted the country has sufficient laws. However, it is in the implementation of the renewable and energy legislation that the actors find insufficient. For this purpose, a re-check of the laws and how and who implements them is needed by the government in cooperation with the private sector (most affected by this CSFs)
- Creation of financial tools for renewable energy projects. An 84% of the actors explain that the tools or funds for large renewable energy projects do not exist in the DR; 90% of

the successful projects in the country have been self-financed or internationally finance (International aid organisations)

- Coordination between the different actors. The discombobulation of the system to obtain a project and then the communication between all the players involved leaves many gaps that have been unfulfilled, and that creates a state of confusion and generate a perceived risk for a renewable energy project that deters many investors and organisations to invest in renewables in the country.
- Transparency in the legal and financial tools available. The interviews reveal that the lack of proper transparency in the financial instruments (banks) and on the legal aspects (PPA) creates, a perceived risk, that does not actually exist, but the uncertainty of the process for obtaining the project and the funds diminishes the importance and need of renewables in the country.
- Another of the general CSFs is to update and provide access to the grid. This particular CSFs is the cost of more than 20% of a project additional or expensive cost of any project in the DR, as the lines as not suitable for renewable injection on a large scale, the owners of project most see fit to suit them and this presents a sure method to fail if not taken into account. This establishes that with the right legal and financial framework and technical solutions, the DR can be a key country in the region for attracting significant investment in renewable energy.

Interview analysis along with literature and document review lead to uncovering the potential success areas for future renewable energy projects for which an organisation can measure and monitor to ensure success. This CSFs, although they produce tangible results, also provide processes that help a project, institution and hopefully the country establish strong ways of thinking, communicating, and making decisions in regards to renewable energy.

The CSFs and KPIs will aid stakeholders, specially decision makers, to make the best decision to develop RE in the DR at the same time, will promote developers and investors into increasing the RE projects and economy in the country. This help will showcase to the government and the public that it is in the country's best interest to invest in RE.

The areas that should be further research are the diversification of the electricity generation portfolio, wind and solar are especially feasible and should be fundamental in the country's energy mix. This diversification could be essential to reduce the country dependence on fuel imports and improve the energy supply security considering the fast-growing energy demand. The decentralisation of the grid, as currently 80-88% of the country is connected to one grid, yet the unreliability and instability of the grid still cause several blackouts and grey-outs in the country.

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