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Data Integration and Data-driven Evaluation for the Non-profit Sector

A study case: Response Innovation Lab

Supervisor

Ch. Prof. Massimiliano Nuccio

Ch. Prof. Anna Cabigiosu

Graduand

Sofia Scquizzato

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ABSTRACT

Data-driven innovation and decision making have proven to be fundamental tools for companies, especially in the last decades. Many progresses have been made in this area, especially in trying to improve accuracy and data quality, from Database Management System, to Data Integration and Business Intelligence. While it is important to gather truthful information, it is also important to analyse and interpret it in the correct way, through Strategic Financial and Non-financial Performance Indicators.

As far as the Third Sector is concerned, Data Integration and Data-driven Evaluation are still under-studied fields, but with high potential.

The purpose of this thesis is understanding the importance of accountability and performance measurement for the third sector, as well as how data-driven decision making for strategic purposes can be implemented, identifying difficulties and limitations, and learning new techniques from the for-profit sector. Performance and Non-financial Indicators for Non-profits will be examined as well, thanks to a study case.

Response Innovation Lab is a collaborative initiative of leading humanitarian non-profit organizations operating in several developing countries, providing support for innovations in humanitarian response. Dealing with more than 1,600 organizations in Uganda alone, RIL needs in-depth knowledge of the environment in order to make more targeted data-driven decisions. For both external (stakeholders legitimacy) and internal purposes, i.e., to improve the effectiveness of strategic decision-making, we will build an Internal Evaluation Index, in order to assess the current situation of a country's activities from a non-financial perspective (focusing on its network), as well as identify strengths and weaknesses.

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INTRODUCTION

An increasing number of businesses are realizing the benefits of using data to manage their workforce more effectively, provide clients with better products and services, and extract valuable insights from their data assets. Non-profits organizations have the same need for accountability as for-profits, and could gain valuable advantage from internal data analysis (Mackrell & Mcdonald, 2014).

Numerous researchers and institutions, among others McCosker et al. (2022) and Silva (2022), indicate that the humanitarian sector should start relying more on data, by adopting a new mindset to bring about significant improvements in efficiency and effectiveness, in order to impact their ecosystem and *modus operandi*. This entails implementing innovative data-driven strategies and approaches in a well-supported and coordinated manner, as Kumpf and Jhunjhunwala (2023) suggests.

However, NPOs have to deal with numerous challenges, such as technological gap, lack of skilled professionals, as well as limited resources. Due to the basic procedures and processes often used by NPOs for data collecting, storage, analysis, and reporting, the data they produce is frequently riddled with errors, duplications, and omissions. Additionally, data is often dispersed over several media platforms, such as spreadsheets, texts, emails, and paper, making it challenging to compile reporting and performance objectives. It's crucial to address these problems if a NPO wants to improve its work.

One method to achieve this goal is the construction of a simple yet effective database (Velu, 2021), upon which a robust Business Intelligence system relies (Mackrell & Mcdonald, 2014), with the aim of evaluating the organization's performance.

Non-profit organizations (NPOs) collaborate with various entities (public and private institutions, NGOs, donors, etc.), which provide them with tangible, monetary,

and non-monetary resources to carry out their work. In order to attract these stakeholders, organizations must be transparent (Burger & Owens, 2010), and disclose financial and non-financial information (Roslan et al., 2017; Zainon et al., 2011). Due to their nature, non-profit organizations have as their primary objective to help as many communities as possible. In fact for stakeholders, non-financial metrics, mission, and values are as relevant as financial well-being indicators (Kaplan, 2001; Ronchetti, 2006; Zainon et al., 2014).

The dual purpose of this thesis is to provide, on the one hand, a general theoretical framework on the development of a data-driven strategy and performance evaluation; while, on the other hand, a practical example of accountability and Business Intelligence innovation and the construction of an assessment index for the organization data-driven evaluation.
The case study is based on the activities carried out by The Response Innovation Lab (RIL), a collaborative initiative of leading humanitarian non-profit organizations operating in several developing countries. The scope of the RIL is rendering a clear enter point for people or actors in general that are approaching a particular humanitarian ecosystem, thanks to some simple Power BI dashboards (integrated with their Web-based-interface SQL database) that provide a general overview of a country's ecosystem, including the internal assessment indicator. Clearly, this is also useful for the organization to make strategic decisions and understand how best to allocate its resources, thereby maximizing their social impact. In fact, as Kaplan and Norton (1996) said: «Measurement matters: if you can't measure it, you can't handle it.»
In order to be accessible to anyone, the index has been constructed using simple calculations based on proportions and averages, including weighted averages.

The budget constraints faced by NPOs also impose restrictions on researching and experimenting with new data-driven strategies. Despite this topic being of considerable importance for the third sector, as Silva (2022) highlights, there are few practical examples in the literature of applications of data-driven models, one example is Mackrell and Mcdonald (2014) BI proposal. Therefore, this research provides

an additional insight to deepen and enhance data-driven evaluation research for the third sector. Furthermore, it aligns with the goals of the 2030 Agenda for Sustainable Development, particularly promoting means for the sustainable and lasting growth of non-profit organizations working to reduce disparities and foster sustainable development.

The composition is divided in three main chapters. The first one aims at exploring the concepts of data management, data integration and performance measurement in the business field, in order to explain fundamental concepts and attempting to provide new sparks and prospects for possible innovations to be applied in the humanitarian aid ecosystem. Thereafter, the second chapter deepen the broad topic of data analytics in the third sector, from a general outlook of data literacy, to the idea of data-driven innovations and strategic performance measurement in non-profit organizations. The last chapter is devoted to the case study analysis: the new data integration system, as well as the data-driven evaluation system implemented by the Response Innovation Lab.

Chapter 1

DATA MANAGEMENT AND PERFORMANCE MEASUREMENT

The first chapter aims at explaining the importance of good and trustworthy data analysis for firms and how it has enhanced their performances, resulting in cost reduction as well. We will then describe tools and technologies developed to ease data gathering, storage and modification, together with creating efficient databases. At last, we will explain the final step of data analysis for business: performance indicators, for which processing good quality information is of great importance.

1.1 The importance of data analysis for businesses and firms

In the past decade, literature has stressed the importance of integrating data analysis into a new cultural mindset. This culture relies on data as a powerful tool for enhancing the generation of innovative methods for gathering, sharing, and creating value. Additionally, it promotes the idea of continuous improvement (Orlando & Mara, 2022). The concept of **data-driven decision-making** (LaValle et al., 2011) has been introduced to emphasize the importance of a new approach that prioritizes gathering data as a means to review business strategies. This approach enables the conversion of complex data into valuable information and knowledge.

In order to conduct data analysis efficiently, it is crucial for companies to have a clear understanding of their goals, gather appropriate and trustworthy data, tidy and arrange the data, input it into suitable analytical tools, scrutinize the data to uncover patterns and valuable information, infer conclusions and make predictions based on the data, and finally, present the findings in a concise and persuasive manner (Grant, 2020).

The process of data analysis demands consistent monitoring, evaluation, and enhancement, rather than being a one-off task. It is a powerful tool that can help achieving better performance, yet it has some challenges and limitations that need to be addressed, as suggested by Grant (2020). First and foremost, **data quality** is fundamental to obtain unbiased, accurate and trustworthy results, if necessary correcting any inconsistencies or error. Secondly, keeping information safe in protected environments with limited access and secure measures allows **data security**. Lastly, the final step consists of **data interpretation**. Drawing conclusions is probably the most difficult of the stages, as it directly affects the decision-making process and depends on assumptions, different perspectives, and context taken into consideration. Therefore, it is crucial to recognize any uncertainty or limitation.

Accuracy and correctness of decisions are the pillars over which **decision-making quality** is built. When information quality and processing capability improve, the quality of decision making can either become better or worse (Janssen et al., 2017). Complexity increases as the amount of data gets larger and appears less and less understandable. The human brain's limited capacity makes it challenging to comprehend and make sense of an unfamiliar situation (this is especially true when dealing with big data). Janssen et al. (2017) claimed that decision-makers should possess the ability to understand and analyze the results of data analytics, without being influenced by visually appealing graphics. Besides, they should not be swayed by fancy visuals and should instead focus on interpreting the outcomes. On the other hand, Janssen et al. (2017) explained that decision quality is enhanced when decision-makers possess knowledge about the relationships between variables within a problem. Conversely, if decision-makers lack an understanding of these relationships, their decision quality may suffer.

The earlier summary indicates that both the quality of inputs and the efficiency

of the process that converts the inputs into results, affect the effectiveness of the decision.

1.1.1 Elements influencing data-driven decision-making quality

According to the study conducted by Janssen et al. (2017), multiple factors influence data-driven decision-making (DDDM) quality. Choosing correct, consistent and truthful information as well as processing them with the correct systems and integrating the whole data chain through the company organisation are key factors. The better the system, the simpler the processing activity. However, researchers underline that to reach certain results workforce skills and capabilities are fundamental. Among other factors there is governance, that comes even before data quality, and is meant to set the right conditions to allow proper data processing. Data quality elements are related and reinforce one another.
The three predominant issues found were related to:

- Noise: the data is inaccurately linked together.
- Error: frequently, the circumstances under which the data is gathered are unknown to anyone but the original source. If there are any alterations in how data is collected without proper communication, it leads to inaccurate outcomes.
- Manipulation: a characteristic of data is *velocity*, which means that, most of the times, models are build with incomplete data, failing to get the whole picture.

Of course when the number of data increases, the level of control decreases.
DDDM necessitates organizing activities pertaining to the collection and utilization of data analytics to examine information. To ensure data is effectively utilized for decision-making, organizations must establish advanced procedures that comprehend the context and extract precise significance from the data. The case study assessed by (Janssen et al., 2017) proved that the Tax organisation analysed could work easily and with more flexibility after establishing a proper department.

Finally, data analysis can be performed using various tools and methods, such as programming languages, software applications, data visualization techniques, data mining, text analytics, and business intelligence. Depending on the type and amount of data available, different data analysis techniques can be applied to answer different questions and achieve different goals. Data analysis can also be done at various levels of complexity and detail, depending on the purpose and scope of the analysis (BPM Team, 2018). However, the basics for a high-quality result is data, and more precisely how they are stored, how they interact and speak. Developing abilities and resources in data management is necessary for establishing an efficient data chain (Janssen et al., 2017).

1.2 Database

Let us start with the basics, databases, the place where information is stored. Database structuring has become critical, especially these days when larger and larger volumes of data are being stored and managed in order to extract useful information. The following section aims at defining databases, the main categories and some useful techniques to adopt.

1.2.1 Definitions

Database

As Professor M. Tamer Özsu (2018) asserts, a **database (DB)** is a structured group of information, gathered and stored in a way that ease their access and modification. The main characteristic that differentiate a database from an elementary data table is the structure. The widely used way of structuring data is through the relational data model, wherein information is arranged into tables and encompassing entities and their respective connections.

For example, imagine a manufacturing company that collects instances regarding goods, the customers for which they are produced, the invoices with order and payment details. This is just one of many examples we could provide, just think of public organizations, such as universities, hospitals or General Register Offices.

Introduced in the 1960s, the concept of "database" has been experiencing constant growth. At present, the market for data storing alone is reaching $50 billion and is showing no signs of slowing down Statista Market Insights (2022), whereas the whole Data Center Market is projected to amount to $342 billion by the end of 2023 Insights (2022).

Database object

In a relational database, a database object is a structure that is utilized for storing or referencing data. Typically, the object individuals commonly work with is the table, while there are also other objects such as indexes, stored procedures, sequences, synonyms, views, and numerous others (Rouse, 2017). Two crucial differences exist in database objects:

- An **object type** refers to the fundamental concept or notion of an object, such as a table or an index.
- An **object instance**, on the other hand, represents a specific example of an object type. For instance, if we consider a table named PRODUCTS_FACT_TABLE, it serves as an instance of the object type TABLE.

Despite subtle differences in behavior and syntax when creating major database object types, their concepts and meanings are nearly identical. Both Oracle and SQL Server treat tables in a very similar manner. As a result, managing them becomes less complicated for the database administrator. Likewise, we can switch from one car to another, each has its own characteristics but the functioning is very similar.

Database relationships

Database relationships are connections between tables formed through join statements in order to extract information (IBM Corporation, 2021). There three main types of relationships:

- One-to-one
- One-to-many

- Many-to-many

The kind of relationship depends on data, hence database manager need to know tables and variables in depth. To evaluate table relationships, it is important to consider both sides, you always deal with a pair of tables. One is referred to as the *primary* (or *parent*), while the other is the *related* (or *child*) (IBM Corporation, 2021).

Figure 1.1 shows a one-to-many (1 = one, * = many) relationship between users ($U = u_1, u_2, ...$) of an e-commerce and the relative order number ($O = o_1, o_2, ...$), where one user (u_i) can have more than one order (o_i), but not the other way round.

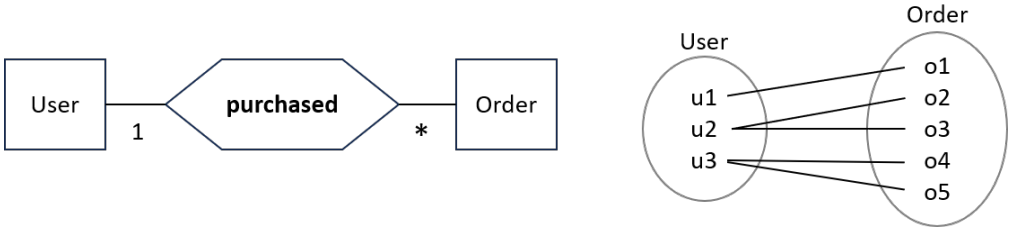


Figure 1.1: The plot represents an ER Diagram to the left and an Occurrence Diagram to the right.

Database dependencies

To ensure the validity of a relational database, it is not enough for the tables to follow to the database schema. The instance of the database must also align with its meaning (Gyssens, 2018). **Dependencies** are constraints that define the relationship between two (or more) items.

The existence of a functional dependency $A \longrightarrow B$[1] enables the relation to be divided into projections without any loss of data. This means that identifying constraints is not only beneficial for maintaining data integrity, but also for representing the data in a more efficient manner and preventing update anomalies by eliminating redundancy (Gyssens, 2018). This process of organizing database information in an efficient way is called **data normalization**. In other words, in order to utilize a relational database, a company must initially structure data in tables. The ease with which a user comprehends this organization and effectively operates the database relies on the arrangement of these connections. If tables are chosen haphazardly,

[1] $A \longrightarrow B$: can be read as B is dependent upon A, and the reverse is not true.

users may face challenges in efficiently executing basic tasks and might struggle to retrieve the desired information (Arenas, 2018).

1.2.2 Data models

Data models can be defined as a collection of structure types, inferencing and integrity rules, that explain how the structure behaves. What makes data models innovative is the set of constraints that wants to understand the relationships between data (Codd, 1981). It consists of a low-detail conceptual system for data manipulation and query[2] architecture, that can be implemented for different kinds of languages (SQL, TML, db, among others). In 1981 Edgar F. Codd [3] said:

> «*The subject of data modeling will be a fertile area for research, development, and application for many years to come. This is due principally to the fact that the meaning of data and the manipulation of this meaning are still so poorly understood. Further, the impact of data modeling on database management will continue to be high, affecting both the design of databases and the design of database management systems.*» (Codd, 1981)

Over the years, data model techniques have evolved and improved significantly, from the first Entity Relationship Model (ERM) introduced in 1976 by Peter Chen (Il-Yeol Song, 2018), to Unified Modeling Language (UML), defined in the late 1990s and early 2000s (Gogolla, 2018). In addition to ERM and ULM, today there are many forms of data models, where each graphical representation has its own properties. Generally, we can say that Class diagrams presently support the inclusion of n-ary relationship types with attached attributes. Layers are allowed for Realtionship types. The presence of Cluster types and unary Relationship types aids in

[2]Query language: a query language is a specific type of programming language that is used to search for and modify data within a database. While the term originally referred to a language used solely for searching within a database, modern query languages like SQL are more versatile and can be used for various interactions with the database management system (DBMS). These interactions include tasks such as defining and modifying the structure of the database, adding data to the database, searching for specific information, updating existing data, establishing constraints to ensure data integrity, creating stored procedures, setting authorization rules, and creating triggers, among others. (Risch, 2018)

[3]Edgar Frank "Ted" Codd was a British computer scientist, founder of the relational database theory, who worked for IBM.

distinguishing between generalization and specialization (Thalheim, 2018).
In the next subsections we will look at the main data models.

Entity Relationship Model (ERM)

ERM is a conceptual framework used to portray the organization and connections between entities in a problem domain. This modeling technique produces a visual representation called an entity relationship diagram (ERD). The ERM consists of three fundamental modeling elements: entities, relationships, and attributes.
An **entity** refers to a *primary object* within a particular area that users need to gather information about and is defined by its distinguishing characteristics (**attributes**). Hence, an entity can be distinguished from other objects by possessing at least one unique attribute. A **relationship** can be defined as a connection among or between different entities. In the context of ERM, it represents a significant connection that must be recognized and stored between entities (Il-Yeol Song, 2018). A relationship can have its own characteristics. An attribute of a relationship reflects a quality specific to the relationship itself and not to any of the entities involved.
However, years later more generalizations and constraints have been proposed to strengthen ER Models, creating Extended Entity-Relationship Model, of which the UML is part (Thalheim, 2018). Extended entity-relationship models and schemas are primarily used for conceptualizing database applications.

Unified Modeling Language (UML)

UML provides a standardized method for creating plans or designs for a system. This includes both abstract elements such as business processes and system functions, as well as more tangible aspects like programming language code, database structures, and reusable software components (Gogolla, 2018). This language primarily utilizes visuals and provides various types of diagrams. Some significant diagram types include class, activity, object, communication, sequence, statechart, and use case diagrams (Gogolla, 2018). We will explain briefly the major components in a class diagram: classes and associations. A **class** is a term used to describe a group of objects that have similar characteristics and functionality. An **associations** denotes

a link between a group of classes and can be identified by a name. Generally, it is represented by a link that connects objects with identical structure (Gogolla, 2018). UML can be depicted in a diagram, that displays objects, attributes, and links as classes, attributes, and associations.

In a nutshell, a data model is an abstract framework designed by data architects or business analysts to arrange data elements and their connections, that have not yet been implemented. To put this system in place in a specific database management system, a database schema is needed, where all data key and relationship is specified at high level of detail, as explained in the following subsection. Nevertheless, not all new Extended Entity-Relationship Model extensions have been fully integrated into database management systems. Step by step, though, we are moving toward data structures represented by ER models that are increasingly functional and complex.

1.2.3 Database schema

A **database schema** outlines the various kinds of entities within a database, the associations and connections between these entities, and the requirements that must be met within the database. The aforementioned DB entities are represented with their own schema according to the different application (e.g., e-commerce, university, manufacturing company, non-profit organisation), for this reason it is known as database description or database definition (Elmasri, 2018b). A schema construct refers to every component of a schema. In conventional structured database programs, the schema is initially established and subsequently, the data is inserted into the database to match the established schema.

Elmasri (2018b) explained that the idea of a database schema was created to address the common occurrence in structured databases where multiple database objects tend to have a similar type or structure, like social media DB. Hence, a new type of database systems has been created which eliminates the need for a complete schema to be created in advance (before entering data). These databases are often referred to as self-describing databases because they store data objects with both the attribute type and its value. These types of databases, known as NO-SQL systems, usually do not require a rigid schema. While a partial one can be defined, the

data objects do not have to perfectly match it. Semi-structured data generally have a schema, but not all data objects need to have identical structures (for instance, XML data).

The scientific reason behind DB schema is saving space in databases, by declaring the same structure or type only once. In fact, the same schema and constraints, that will be applied by Database Management Systems automatically, are shared among all the records (Elmasri, 2018b). This makes DBMS working easily, as they know the structure beforehand.

1.3 Database Management System

1.3.1 Definition

A **Database Management System** (DBMS) is a sophisticated software module that has a broad application and aims to streamline various tasks involved in database design, creation, management, querying, updating, and modification. It is versatile as the same DBMS software can serve multiple database applications, manufacturing enterprises, transportation companies, universities, but also entities in the nonprofit sector.

Some examples are Oracle Database developed by Oracle and SQL Server by Microsoft, as well as MySQL, MariaDB and PostgreSQL.

The complexity of DBMS stems from the involvement of numerous tasks across different levels: internal and external (Elmasri, 2018a).

Within its **internal components**, it has modules that handle various tasks such as managing simultaneous executions and recovering from errors, distributing and replicating data, optimizing resource-intensive queries through indexes and efficient storage structures. Additionally, there are other modules that closely collaborate with the operating system, disk, and main memory of the underlying computer systems. At the **external level**, there are various components and programming languages available to outline the structure of a database, communicate with the database using advanced query languages or API interfaces, establish security and authorization rules, and undertake numerous other functions.

The classification of DBMS is usually based on the type of data model it utilizes (hi-

erarchical, relational, graph, ...). Besides, Elmasri (2018a) specifies that a number of systems offer limited capabilities in terms of high-level query languages, like certain NOSQL database management systems. Conversely, other systems offer robust and powerful query languages, such as the SQL language specifically designed for relational DBMSs. Similarly, while some DBMSs provide complete concurrency control and recovery, others lack this feature. This pattern applies to various functionalities including security, distribution, replication, among others (Elmasri, 2018a).

DBMS components

A database system consists of various self-contained software pieces called **components**. These components can be defined at different levels of detail. For example, in a relational database management system, the components include the client communications manager, process manager, relational query processor, transactional storage manager, and utilities. Each component of a relational DBMS can be further divided into multiple subcomponents (Gehrke, 2009).

1.3.2 DBMS key applications

The process of **Data definition** is a necessary step integrated in the larger design process of database creation. Once the requirements for a specific database application are gathered, the following action is to proceed with the data definition process, which involves generating the schema constructs within the data model employed by a specific DBMS.
The entity, relationship, constraints as well as attributes types choice is included in the data definition process. The main focus of DBMS is to separate data from the application. Despite advancements in concepts and technologies, the central focus on data has continued to prevail (Helland, 2018).

The primary aim of a database management system is to efficiently handle data management, aiming to lower expenses and enhance functionality. A crucial aspect of these systems is the development of advanced concepts that separate applications from data. Currently, the relational data model holds the majority in today's database management systems (Helland, 2018). Changes made to the application can be done without affecting the data and vice versa, enabling the two to evolve

independently. The use of advanced concepts that distinguish the data from the application unlocks various beneficial qualities.

1. The ability for the **data and the application to evolve separately** enhances flexibility and adaptability in the system. It allows the application to be modified or upgraded without impacting the data, and the other way round. In fact, the application is based on a schema that adapts as technology evolves, representing data in an ever-changing way (Helland, 2018).

2. **Flexible and scalable architecture**, that represents information according to the conceptual schema adopted managed by the DBMS and cater for multiple applications.

3. **Business intelligence** has become a crucial use of database management systems. It allows users to directly access and modify data through the database management system. This is made possible by the conceptual schema, which describes the data independently of its physical schema and applications. Access to data on an ad-hoc basis is facilitated by this abstraction. Business intelligence has grown into a multi-billion dollar industry, as enterprises have discovered the significant impact that knowledge derived from quick and ad-hoc queries can have on their business. Three key mechanisms, namely schema definition, data manipulation language (DML), and transactions, are essential in providing these abstractions for applications (Helland, 2018).

4. Besides, not only are DBMS used to manipulate data, process queries, retrieve and store data through key-value pairs, but also to reset ans recreate the original dataset if something goes wrong.

In a nutshell, Database Management Systems are extensively employed to store a majority of the data utilized in modern businesses. Nearly all enterprise applications are developed using database management systems. Although some applications accessed by clients rely on file system structures to store data, most applications accessed by servers utilize a DBMS.
In section 1.6 we will see how useful data schema and Database Management Systems are, in order to provide accurate and trustworthy performance measurement tools for companies.

1.4 Data Integration

As Poulovassilis (2009) stated, if an application needs to combine data from multiple sources to meet users' needs for queries and analysis, a potential solution is to incorporate the necessary data organization and consolidation features into the application's programming. However, this could prove to be a challenging and time-consuming task, and it might also impact the strength and ease of maintaining the application. The existence of these issues has prompted the creation of structures and approaches that generalize the functionality of transforming and aggregating data, and incorporate it into versatile data integration software.

1.4.1 Definition

Data integration is the act of merging information from various sources into a single, unified one. This process enables the execution of queries and analyses that would not be possible using the separate data sources on their own.

Since the 1990s, many structures and methodologies have been developed to keep data sources integrated, from the field of biology and medicine to business. Different individuals and research settings create data sources for various reasons. To cater to the requirements of new users and applications, it is necessary to combine them. However, this integration process involves reconciling differences in data models, data representation and exchange formats, content, query interfaces, and their processing abilities (Poulovassilis, 2009). Not only in the biological but also in the corporate field, data can be very volatile due to the unpredictability of markets, that are dynamics and change continuously. For this reason, data sources may modify their data formats and content without considering the impact on integrated resources that rely on them. Furthermore, data integration is valuable not only for big businesses but for all types of organizations. In today's competitive landscape, it is crucial for every business to have a **data integration strategy** in order to effectively utilize their data.

Almost every organization utilizes various applications like CRMs, accounting software, asset management systems, and spreadsheets to support their operations. However, these applications often operate in isolation, leading to communication

gaps and misunderstandings between different departments or processes (data silos). Consequently, making critical business decisions based on inaccurate information derived from these gaps can yield poor or even harmful outcomes (Matillion Ltd, 2023).
In these contexts integrated resource are key, acting as data sources for more complex integrations, leading to a growing network of interdependencies among data resources (Poulovassilis, 2009).

Several companies employ data integration solutions, struggling with interoperability between diversified data. An example of data integration solution is ETL tool, i.e., an abbreviation for Extracting, Transforming, and Loading data (Matillion Ltd, 2023). The first step, **extraction**, consists of understanding and evaluating data quality, which will then be linked together through queries or other specific connectors. Next, the data is **transformed** while maintaining its integrity in the target platform. This action involves understanding both source and destination format (Almutairi et al., 2021). Typically, the format is changed and data cleaning is performed, removing duplicates, errors and missing values. Generally, 15% of data can be assumed to be missing or mistaken (Stonebraker & Ilyas, 2018), therefore, a data cleaning tool, which takes into consideration all steps and requirements (that might overlap or be connected) is key. The transformation phase also includes the application of rules and constraints necessary for the analysis. The third phase corresponds to **loading**, which means storing information into the target server, after having estimated the fault-tolerance (Almutairi et al., 2021). It is advisable to perform it often, to ensure the most up-to-date information possible. In recent years, due to the good performance achieved, uploading is performed in the cloud (Matillion Ltd, 2023).

IT companies utilize suitable technology to store, inspect, and securely interchange information. They develop and incorporate valuable software for transferring data seamlessly across diverse platforms. Over time, data integration techniques were created and merged with data warehouse and ETL procedures (1.2). Big data utilizes various tools and technologies such as Hadoop, NoSQL, MapReduce, Cloud-

era, and Cassandra (Almutairi et al., 2021).

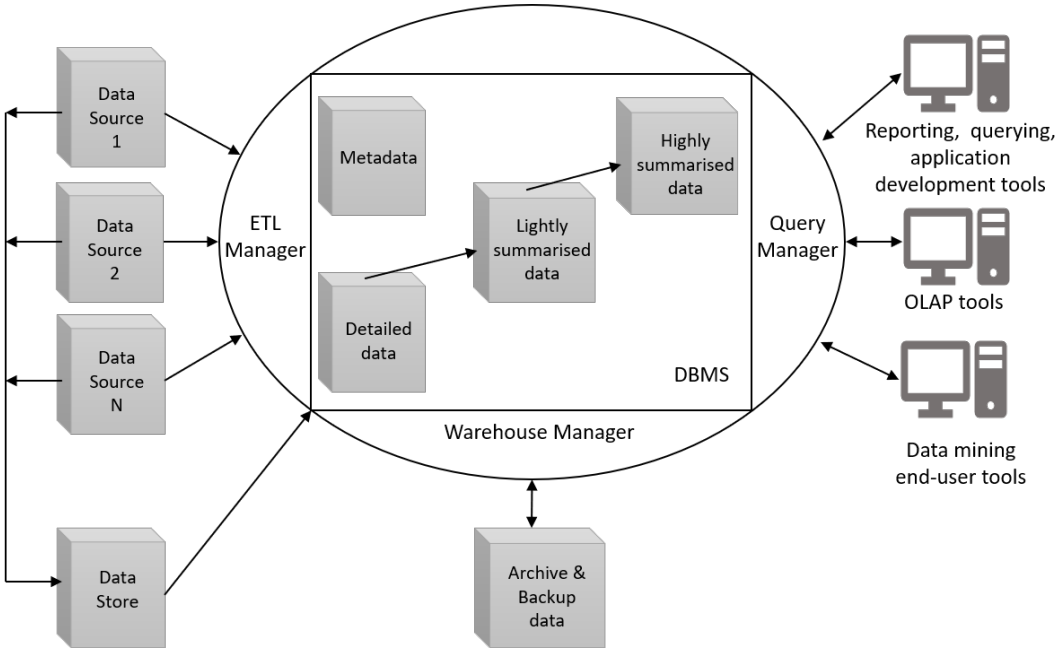


Figure 1.2: An example of data integration by means of data warehouse from Almutairi et al. (2021).

There are multiple strategies for integrating data:

- Data warehousing
- Middleware data integration
- Data consolidation
- Data virtualization
- Application-based integration

There are two options for performing data integration: **physically** or **virtually** (Almutairi et al., 2021). The former, physical data integration, involves using data warehouse techniques to store data in multiple locations worldwide (e.g., warehouse-based data integration). The latter includes a series of methods, the most used are Schema matching approach, Local-as-View (LAV) / Global-as-View (GAV), XML based data integration, NoSQL based data integration (Almutairi et al., 2021). No one approach can be considered universally applicable and efficient for all situations and data types. It is crucial to comprehend the specific needs of data integration and employ the appropriate method in order to effectively integrate data.

Data integration is essential for facilitating data transfer, maintaining consistency, and converting data in a heterogeneous system across various platforms(Almutairi et al., 2021).

Stonebraker and Ilyas (2018) together with *Tamr*[4] conducted a study on data integration, understanding that many large businesses break down into separate units to promote flexibility. These units have the autonomy to operate independently, without being limited by company-wide concerns. For instance, it is often impractical for all units to adopt a unified global structure for specific entities like order number or customers because each unit has different needs. Waiting for unanimous agreement across all units would result in long delays. As a result, data is stored in separate silos for each unit, with varying levels of detail, structure, and even conflicting information. Numerous silos exist within a typical enterprise, and merging them together afterward is a key objective for many businesses to achieve operational advantages. Often, the process of gaining profits in business includes cross selling, gaining a deeper understanding of the customer demographic, and reducing the costs associated with product lines. These actions typically encompass several divisions within a company and necessitate organizing, merging, connecting, and consolidating data from various sources. However, data integration must be scaled to be truly effective. Traditional solutions, known as MDM (*Master Data Management*[5]) systems, do not scale adequately, as they require rules declaration and data transformation for each dataset as well as matching columns manually (Stonebraker & Ilyas, 2018). Linking thousands of columns manually or semi-manually s well as declaring rules that might overlap or contradict is not a practicable solution, especially if we need to maintain our database. In fact, MDM is recommended in case of small non-scalable problems, yet it is impossible to know certainly the future extent of a project. For this reason numerous ML solutions are being developed, but with two main limitations: lack of data to train models and results explainability, which can be complicated.

[4]www.tamr.com

[5]Master Data Management: according to Jonker et al. (2011), MDM is involves a collaborative effort between business units and IT to streamline, clean, publish, and safeguard shared information assets in a workflow-driven manner within the entire organization.

1.4.2 Challenges and advantages of data integration

Challenges

Although data integration can offer substantial advantages to businesses, it is not without its difficulties. The first challenge is related to **data volumes** (Matillion Ltd, 2023). The quantity of data generated by our systems has increased significantly, especially in the last few years. To effectively integrate this data, it is crucial to have a scalable storage solution. It is no longer economically viable to continually invest in physical infrastructure to accommodate the expanding data volumes, therefore, cloud data warehouses are very often used. Secondly, **data conversion** is a complicated problem due to the varied formats, types, and methods of data sources, which often leads to data loss. Additionally, the presence of structured and unstructured data in different databases poses challenges when it comes to storing them, incresing maintainability issues (Almutairi et al., 2021). Thirdly, it requires a lot of **time and resources** to bring together data from various sources into a single central database, as data types are often non-uniform and new. It is necessary to have an ELT solution which is quick, easy-to-implement and adaptable. Lastly, deploying and using enterprise data integration and ETL solutions can be challenging due to their **complexity**. This is particularly the case for bigger companies that have dispersed data repositories, lack a single authoritative data source, and require various departments to independently access data for analysis. If organizations aim to enable universal data accessibility, they must implement a data integration plan that guarantees data governance, adheres to security criteria, and simplifies and scales the process of integrating enterprise data (Matillion Ltd, 2023).

Benefits

Nevertheless, there are numerous advantages a data integration system can bring. The primary benefit is **data silos elimination**, streamlining the process for data scientists to readily access and scrutinize data, and subsequently transforming it into valuable business intelligence and enlightening revelations. That ultimately enables you to make better-informed choices more efficiently. Besides, it **decreases the possibility of making errors**. Running reports can be a difficult task as organi-

zations possess a large and continually expanding and evolving amount of data. In the absence of a centralized data repository, employees responsible for reporting face the challenging task of manually collecting all the necessary datasets required for their reports. Inaccuracies in their reports can occur if there is missing, outdated, or flawed data. However, with a constantly updated data integration solution in place, employees can always access the most recent and precise data (Matillion Ltd, 2023). Finally, consistently utilizing data transformation processes has the potential to **enhance your organization's data quality and integrity**. This practice aids in identifying and resolving any data-related problems, ultimately resulting in improvements for both data quality and integrity. All in all, data integration leads to enhanced decision-making, improved customer experience, increased productivity, streamlined operations, and the ability to predict future trends. Implementing data integration undoubtedly improves business performance (Almutairi et al., 2021; Matillion Ltd, 2023).

1.4.3 Data Integration: The way forward

Stonebraker and Ilyas (2018) pointed out the future orientation of data integration to help building and improving scalable models, especially for large corporate environments.

At first, high provisioning and tuning costs are currently associated with enterprise data integration. Skilled professionals are needed to create appropriate workflows, configure components, select effective cleaning methods, and ensure sufficient and meaningful training data availability. However, with advancements in tools, these challenges will become less intimidating. Consequently, this research field holds great potential for future innovations. Then, it would be preferable to use human interaction less and less and employ data integration application that simplify data scientists tasks. Besides, data scientists most time consuming activity is finding relevant and reliable data sets (90% of their time is pent to find proper data) on which to train and test models. Lowering this time is an ambitious challenges. Finally, Stonebraker and Ilyas (2018) expects data integration will have various other purposes in the future and, as a consequence, models can be reused. One significant issue that every major organization worldwide faces is integrating suppliers into

their operations. Additionally, there are many common aspects among enterprises' applications. The potential for using transfer learning and reusing machine learning models is immense. However, the challenge lies in the fact that enterprises consider their supply chains to be highly confidential.

1.5 Data Integration for Business Intelligence

Data integration has proven to be of great importance both for Business Intelligence (BI) and Business Analytics (BA), i.e., a branch of data analytics.

Business Intelligence (BI) involves the identification, extraction, examination and representation of business-related information to enhance the decision making process. It consists of a diverse range of tools, programs, and approaches that enable organizations to gather information from both internal and external sources (Li & Gu, 2019). For instance, it can include data on sales revenue pertaining to various products and departments, as well as details on costs and incomes (Mousa & Shiratuddin, 2015). BI is commonly used to describe a range of computer-based concepts, methods, systems, structures, and technologies. These elements convert unprocessed data into valuable and practical information that can be utilized for business goals. For many companies, the capability to recognize and capitalize on novel possibilities while also implementing a successful plan can lead to a competitive edge in the market and enduring stability (Mousa & Shiratuddin, 2015). Business Intelligence differentiates from **Business Analytics (BA)** as they answer two different questions; the former wants to know **what** has been done in a specific period of time, the latter tries to find out the reasons **why** that particular fact was registered, so that more precise decision can be taken in the future.

The present section aims to explore new data integration approaches and techniques applied to Business Intelligence.

To demonstrate its great importance, some examples of the application of data integration techniques to the world of business intelligence will be described below. We will start from an integration approach of hybrid databases based on SQL in cloud computing environment (Li & Gu, 2019), after that a Data Warehouse ap-

proach for BI (Garani et al., 2019) and finally how data virtualization can be applied to Business Intelligence (Muniswamaiah et al., 2019).

1.5.1 An integration approach of hybrid databases based on SQL in cloud computing environment

As described in the previous paragraphs, the latest business intelligence platforms are built on multiple databases, and therefore an appropriate software architecture is needed. Li and Gu (2019) have realized the importance and added value that hybrid databases can bring, proposing solutions to integrate in the same query, SQL and NoSQL data sources. Both data structures are essential, as they are useful in different situations. In fact, relational SQL databases are still considered superior for managing middle or small amounts of data, and many existing systems rely on this type of database. However, with the increase in data size, enterprises are turning to NoSQL databases for analyzing and accessing big data more efficiently and quickly (Li & Gu, 2019). Some examples of NoSQL database products are *Hbase*, *Redis*, *Neo4j*, and *MongoDB*.

To successfully incorporate diverse database systems, researchers had to tackle challenges such as complex nested queries and joins. The integration model for combining relational and NoSQL data-stores, as suggested in the research paper, referred to as MSI (multiple sources integration). The input for MSI consists of SQL statements, that are simplified and adapted; then optimized and merged through a DBMS adapter component, that allows to communicate with NoSQL languages and distribute data sources properly. The output is the outcome of the SQL process.

Being able to integrate different types of data sources allows higher-level analysis to be carried out. The usage patterns of MSI are primarily categorized into three types.

1. OLTP pattern: MSI is primarily utilized as a support tool in OLTP applications, such as e-commerce, e-government, internet of things, and smart cities. These scenarios often involve multiple database systems, including relational databases and NoSQL data-stores.

2. Big data analysis pattern: MSI plays a role in two aspects. First, it can

be used as a support tool for big data analysis applications, accessing data warehouse systems like *HBase* NoSQL database through SQL. Second, it can be employed as a data synchronizer, transferring data from OLTP database systems to data warehouse systems.

3. Hybrid pattern: The hybrid pattern is a common approach in practical applications, where both the OLTP pattern and big data analysis pattern coexist. In this pattern, MSI acts as a bridge between the application layer and the data storage layer. Additionally, it facilitates communication between different data storage systems.

1.5.2 A Data Warehouse Approach for Business Intelligence

The second case of data integration as a means of advancing data analysis considers a particular case of Data Warehouse innovation.
A cloud-based data warehouse (DW) allows users to conveniently access and analyze data from various sources and locations. DWs are particularly relevant for business analysts and decision makers to perform data analysis and reporting. The handling of temporal and spatial data is crucial for decision-making and marketing strategies, in addition many applications require specialized treatment and modeling of these types of data as they cannot be efficiently handled in a traditional multidimensional database. Garani et al. (2019) developed a new DW system for the telecommunication industry in order to boost spatial-temporal data warehousing.

More and more Cloud Computing platforms now offer services for storing and managing large Data Warehouses [6], as well as cloud providers (like Oracle, IMB). The availability of all Data Warehouse features through the Internet makes it easier to access and eliminates storage limitations, as clouds provide virtually unlimited storage capacity. Big data poses a challenge for new cloud-based DW systems because it requires unlimited storage and secure data archiving that is always accessible (Garani et al., 2019).
A DW can be seen as a database that stores a considerable amount of data, arranged in multiple dimensions and fact tables.

[6] Just think of *Azure* SQL by Microsoft, SQL Amazon *Redshift Cluster* or Google *BiqQuerry*

The research paper underlines the urgency of discovering new logical schemas to express data, and Garani et al. (2019) developed Spatiotemporal DW system based on a Starnest-logical-schema. A **starnest schema**, that was created by blending features from both star and snowflake schemas. In this schema, data is clustered in nested tables to represent hierarchy levels seamlessly, enabling a more intuitive depiction of dimension aggregation levels. Dimension tables are structured as nested tables with subattributes, where more specific features are inside less detailed ones in a hierarchical way.
Temporal data warehouses (TDWs) are classified as DWs that manage data that changes over time. Similarly, Spatial data warehouses (SDWs) store and handle spatial data. The integration of TDWs and SDWs results in the formation of **Spatiotemporal data warehouses (STDWs)**.

The study demonstrates that queries that just rely on flat tables tend to be slower in comparison to those that utilize both nested and flat tables. This is because accessing nested tables involves a smaller number of rows compared to accessing flat tables.

Companies allocate significant financial resources in order to improve their business decisions through the implementation of Business Intelligence (BI). Data Warehouses (DWs) play a crucial role, serving as a vital management tool. DWs are responsible for transforming operational data into a format that is easier to comprehend and more user-friendly, facilitating analysis. The findings from the study can contribute to making improved choices in marketing products that cater to customers' preferences. For instance, individuals who have never relocated from their hometown may not be suitable candidates for a long-distance plan. Likewise, it may be beneficial to provide diverse plans to various age groups residing in distinct geographical areas.
The case-study took into consideration telecommunication companies, however the solution can be used to support other businesses in different fields. In order for a company to thrive, it is essential to make effective decisions by efficiently managing pertinent data, and a properly constructed data warehouse greatly aids in achieving this goal.

1.5.3 Data Virtualization for Analytics and Business Intelligence in Big Data

The third case study we wanted to discuss, presents another aspect of data integration, data virtualization.
Data Virtualization goal is to enable organizations to provide their data consumers with a synchronized and up-to-date comprehensive perspective of data, gathered from different sources and systems. Data virtualization deals with both structured and unstructured information, encompassing traditional and non-traditional sources of business intelligence. Its purpose is not to replace data warehouses but to enhance them by integrating real-time updates from various data structures (Reeve, 2023).

Traditionally, organizations have relied on data warehouses and an ETL process to obtain integrated data. However, in recent times, Data virtualization has been employed to accelerate the data integration process. Data virtualization and ETL are often used together as they both perform sophisticated data transformation and cleansing tasks, and load the data into a designated data repository (Muniswamaiah et al., 2019). A company or an organization need many and varied source of information, that can be gathered in many different ways.
The process of data integration consists of six phases. It starts by data discovery, i.e., collecting data and cleansing, in order to remove inconsistencies. Thirdly, data are transformed and normalized, to be then aggregated and joined. The fifth step is data analysis, that aims at accessing hypothesis. Finally, data are represented through data visualization tools. Data virtualization carries out processes such as data cleansing, data transformation, data association, and data correlation on source data stores without physically moving the data in between. These stages are performed separately, with each step utilizing virtual tables that utilize data from the previous step.

As data do not need to be duplicated and stored physically, this helps organisations save money and makes business decisions more agile (Muniswamaiah et al., 2019) as data is easily available. Data virtualization allows for logical data warehousing capabilities by federating queries across multiple data warehouses and providing the

ability to access data using various protocols. Data Virtualization is more efficient and quicker as it assigns queries the task to get data stores. This helps speed up the dialogue between IT and users, enabling faster models to be developed.

Data virtualization is a viable option for Business Intelligence and analytics when there is a requirement to merge and rapidly query structured and unstructured data from various sources, both stored in data warehouses and virtually. Finally, Muniswamaiah et al. (2019) claims that an integrated data view offers the advantage of adaptability and a quick return on investment for any choice made by the company.

1.6 Performance measurement for companies

At the beginning of the 19th century Henry Ford conducted analytical research and analysis on the T-Ford model during its construction; it demonstrates that the idea of analytics is not a recent development (Velu, 2021). What has definitely been innovated are the methods and techniques, and Business Intelligence and Business Analytics have certainly helped this process, as described in the previous section. BI acts as a facilitator, allowing the organization to become smarter, work more efficiently, and make improved decisions by utilizing data. Facilitating every business unit to take their own decisions based on some metrics, known as Key Performance Indicators, allows companies to become more efficient. The following section aims at discovering why is it important to evaluate a performance, what is a key performance indicators and how it is developed, the concept of Strategic Performance Measurement together with its benefits and limitations.

1.6.1 The importance of performance measurement

According to Velu (2021) a well-organized business intelligence system offers distinctive advantages, specific to the industry in which a company operates. The extensive utilization of data technology and analytical indicators is beneficial for companies as it enables them to discover valuable information. Velu (2021) stated further that data is key to look both backward and forward, making valuable decisions about the present and the future (i.e., forecasting).

Literature provides numerous examples of how business performance analysis has been critically important in improving productivity both in companies that offer services and the one that manufacture goods. If companies utilize their rich organizational knowledge together with the latest advanced elements and administrations tools, it will decrease the extent to which competitors have a competitive advantage over them (Velu, 2021).

Lord Kelvin, a physician and engineer who lived in the XIX century, said that quantifying information and expressing them numerically, allows to gain a deeper understanding of a subject, providing a more comprehensive and scientific perspective. However, according to Badawy et al. (2016) research, only a few leaders, accountants, and consultants have explored and understood the true meaning of Key Performance Indicators (KPIs) and genuinely monitor their exact indexes.
The context of international organizations' methods for achieving economic success have been significantly transformed by the global economy. For this reason, Dossi and Patelli (2010) studied how multinational companies evaluate and monitor their work and capabilities. Specifically, **Performance Measurement Systems** (PMSs)[7], and more specifically SPMSs, are believed to expand their magnitude in order to enhance the use of strategy and be employed interactively to foster global knowledge exchange and learning.
«Strategic PMSs are considered as strategy implementation tools, capable of coordinating dispersed actions and creating goal congruence» (Dossi & Patelli, 2010). PMSs, in this regard, serve as strategic instruments by contributing to the achievement of strategic goals through three key mechanisms: (1) enhancing comprehension of the connections among different strategic priorities, (2) improving the communication of the relationship between objectives and actions, and (3) optimizing the allocation of resources and tasks. In doing so, numerous international companies include a portfolio of financial and non-financial indicators.

[7]Performance Measurement Systems (PMSs) are succinct collections of quantifiable metrics, both financial and non-financial, that aid an organization's decision-making processes by gathering, processing, and analyzing information about its performance, and presenting it in a concise format. Strategic Performance Measurement Systems (SPMSs) represent a specific subset of PMSs (Gimbert et al., 2010).

Gimbert et al. (2010) examined the role of PMSs in relation to the strategy formulation process, **Strategic Performance Measurement Systems (SPMSs)**, comparing organisations that adopt them and the one that do not, finding out that it plays a crucial role in influencing the scope and direction of corporate strategic changes.
In mid-1980s performance indicators were conceived as instruments to put strategy into practice, however in the last decade thanks to causal-oriented models like Balance Scorecards, Performance Prisms and *tableaux-de-bord*, SPMSs proved their potential significance in the strategy development process (Kolehmainen, 2010), and how they can effectively bridge the gap between strategy formulation and execution. In fact, Gimbert et al. (2010) found out SPMSs can assist in challenging the strategic assumptions being made and uncovering potential issues with the company's strategy in advance with respect to the organizations that do not employ them. It reveals that there is a strong relation between the initial strategy-making phase and Strategic Performance Measurement Systems (SPMSs), not only with implementation.

All in all, performance measurement enables organizations to drive and redefine medium/long-run strategy, as well as adjust short-term tactics, thanks to a continuous feedback provided by indicators, increasing effectiveness and competitiveness.

Financial and non-financial indicators

According to AICPA CIMA (2013) **Financial Indicators** typically rely on components from the income statement or balance sheet and can also track changes in sales growth (across product categories, distribution channels, and customer segments) or in expense categories. **Non-financial Indicators** consists of alternative metrics employed to evaluate activities considered pivotal to an organization's strategic goals. These non-financial indexes often encompass measures related to customer relationships, operational efficiency, employee performance, quality control, and the organization's supply chain or project pipeline. Some individuals prefer using the term extra-financial instead of non-financial, indicating that all measures contributing to organizational success ultimately have financial implications (AICPA CIMA,

2013).

In the last few years, Non-financial Indicators have become more and more widespread and are usually combined with the usual financial ones. Dossi and Patelli (2010) research outlines that this is especially true for international companies; and have proven to be very useful when dealing with strategy-making, allowing for more in-depth understanding of corporate internal dynamics. The study reveals that about 50% of the indicators (of the inquired organizations) included in dashboards and balance scorecard frameworks is extra-financial (Dossi & Patelli, 2010).

As Dossi and Patelli (2010) stated, the motivation for incorporating non-financial indicators into PMSs has frequently been associated with the financial metrics limitations. Non-financial indicators are regarded as more forward-thinking, thanks to their greater predictive capability for future performance, better suited to gauge intangible assets, and less susceptible to manipulation compared to financial metrics. Therefore, utilization goes beyond quality control and diagnostics. In fact:

- PMSs that are composed of non-financial indicators as well, provide a more holistic view of the factors influencing performance, as they assess aspects of performance that go beyond financial outcomes.
- By incorporating various measurement perspectives, these systems have a tendency to harmonize conflicting strategic priorities.
- Non-financial indicators help operationalize strategy, enhancing the understanding of goals and the actions needed to achieve them.

Non-financial performance measures (especially KPIs) are expressed in a numerical form most of the times, allowing a more precise measurement and management. However, non-financial information need to be explained in detail in order to be truly understood by stakeholders, as they are specific for the production process of each company (Zarzycka & Krasodomska, 202).

1.6.2 Exploring key performance indicators

As described by Badawy et al. (2016), **Key Performance Indicators (KPIs)** are a set of quantifiable metrics that organizations use to measure their performance

and progress towards achieving their goals[8]. KPIs help companies and institutions to identify areas that require improvement and to make data-driven decisions, by controlling information and enhancing transparency. They can be presented in various formats such as tables, graphs, and charts, and can be applied to different fields such as finance, marketing, and human resources, just to name a few.
David (2010) identified four categories of performance metrics:

1. **Result indicators (RIs)** inform you about the actions or tasks you have already completed.

2. **Key result indicators (KRIs)** provide an assessment of your achievements in a specific area or critical factor for success.

3. **Performance indicators (PIs)** outline the actions or tasks that are necessary for you to undertake.

4. **Key Performance Indicators (KPIs)** offer guidance on the actions or tasks that can significantly enhance your performance.

David (2010) compared the relationship of the four measures to the onion analogy. «The outside skin describes the overall condition of the onion, the amount of sun, water, and nutrients it has received, and how it has been handled from harvest to the supermarket shelf. The outside skin is a key result indicator. However, as we peel the layers off the onion, we find more information. The layers represent the various performance and result indicators, and the core represents the Key Performance Indicator.» (David, 2010)

Key Performance Indicators (KPIs) serve as a collection of metrics that spotlight the essential aspects of organizational performance crucial for achieving success. Peng et al. (2007) identified the following three types of indicators:

1. Leading indicator, is a key performance indicator (KPI) that evaluates activities that have a substantial impact on future performance and can be compare to multiple lagging indicators.

2. Lagging indicator, evaluates the results achieved from previous actions and activities.

[8]It means that KPIs can be considered as a subset of PMSs

3. Diagnostic measure, is a key performance indicator that does not directly influence outcomes or follows them, but indicates the status of processes or activities (For instance, the number of cars sold every month by a company).

Developing efficient and impactful Key Performance Indicators (KPIs) plays a crucial role in ensuring the prosperity of a business. This allows the organization to respond promptly to changes and be well-prepared for future developments. However, the process of identifying leading indicators is often challenging and time-consuming, involving the collection of necessary data over several months, defining and establishing measurement methods and rules, selecting preferred metrics, and actively seeking feedback. According to Badawy et al. (2016), good KPIs should possess the following characteristics:

- **Simplicity**, KPIs need to be easily understandable, suggesting clear action(s) to be implemented by the team, correlated to the result the company wants to obtain. Not being able to get the true meaning of KPIs leads to a failure.
- **Sparsity** do not include too many indicators, otherwise you could lose the central focus. A collection of numerous KPIs without clear ties to business goals could indicate a more significant issue.
- They need to be **Balanced**, including both financial and non-financial metrics and **Aligned**, so that they do not weaken each other.
- **Regularity** on measures (monthly, daily, weekly, ...)
- **Reliability**, as they cannot be eluded by employees and have to be linked to a team, so that its leader can take the right decisions to get back on track.
- KPIs need to be referenced to a given context, having a clear understanding of its origin. For this reason, it is essential to know exactly the strategic focus when selecting KPIs.

Business monitoring typically relies on an information system which provides data on various Key Performance Indicators (KPIs). This monitoring is crucial for identifying issues in business performance and alerting decision makers to their source. It is an essential function for companies as it allows for timely corrective

actions. However, it can also be challenging due to the vast amount and rapid pace of data that requires processing. Generally, KPIs are published on dashboards or Balance Scorecards and updated punctually, so that everything is correct.

1.6.3 How to develop a KPI

According to Badawy et al. (2016), the typical journey to develop a KPI within a company is composed by seven steps.

The first step is to identify a goal. Whether it stems from the need to solve a problem or situation that has arisen or reflects new business objectives, identifying the goal appropriately is critical. In addition, you have to decide how it should look like (scoring, percentage, target number, etc.). After that, you need to define a procedure to follow in order to establish KPI measurement. This could involve redesigning the entire methodology or it could be accomplished by implementing quality assurance evaluations at various points during production. However, before using the capacity KPI, that measures the efficiency of a production process, you should measure what and how you can produce in a period of time.

Other important KPIs to be developed before others are financial and stakeholder ones, so that after reaching (or not) a profit or a scoring target, it directs to specific strategic goals. For this reason they should be established before others. Furthermore, Thinking about input KPIs before determining the product is not feasible. For this reason, input KPIs should be determined after product KPIs.

Lastly, remember to choose the most suitable Key Performance Indicators, communicate them, approve them, and record them. It is important for companies to be open-minded and innovative when creating KPIs, as their ultimate objective is to bring about the necessary performance enhancements outlined in the corporate strategic plan. KPIs have the ability to influence divisions and departments, leading to unique behaviors and improving particular processes. They also shape discussions and set the topics for administrative meetings (Badawy et al., 2016).

By crafting well-designed KPIs, management becomes capable of asking the appropriate questions rather than simply providing flawless solutions and outcomes.

1.6.4 Strategic Performance Measurement for companies by Kaplan and Norton

«In the twenty-first century, **Knowledge Management (KM)** is widely acknowledged as a tool for sustaining a competitive edge» (Gupta & Chopra, 2018). In an era marked by the globalization of the markets and rapid advancements in technology, the significance of Knowledge Management (KM)[9] and its effects on the success of an organization cannot be underestimated. Knowledge increase business competitiveness and innovation, however most of the times a huge part know-how is tacit and not formalized. For this reason, KM improvement and continuous maintenance are key activity for a company to survive, as well as maintain competitiveness in the long term.

Created by Kaplan and Norton, the **Balanced Scorecard (BSC**) offers a holistic perspective on an organization's operational performance and strategic goals. They presented a theory suggesting a sequence of cause-and-effect events that guide an organization towards long-run success. The BSC combines financial metrics with various other crucial performance indicators (KPIs) to establish a viewpoint that includes both financial and non-financial elements. In fact, it allows for an exhaustive Organization Performance (OP) comprehension (Gupta & Chopra, 2018).
The Balanced Scorecard (BSC) offers top-level management a thorough structure that transforms a company's mission and strategy into a cohesive collection of objectives and metrics. It consists of four perspective levels: financial performance, customer satisfaction, internal process and learning and growth, with the goal of informing staff about present and future progress drivers (Kaplan & Norton, 1996).
Financial perspective. The Balanced Scorecard maintains the financial perspective because financial metrics are useful for summarizing the tangible economic outcomes of actions that have already been implemented.
Customer perspective. Kaplan and Norton (1996) affirmed that within the customer perspective of the Balanced Scorecard, managers should delineate the market

[9]Knowledge Management (KM) is the organizational practice utilized to generate, share, formalize, distribute, and establish both implicit and explicit knowledge (Darroch, 2003). The theoretical foundation of KM has been drawn from a range of fields, including economics, computer science, and philosophy.

segments and customers in which the company unit will engage, along with the performance metrics for the business unit within these specified segments. This enables achieving better future profits.

Internal-Business-Process Perspective. In the internal-business-process perspective, top-level management identifies the essential internal processes in which the organization needs to excel. This facilitates the business to:

1. Provide a valuable proposition to customers
2. Fulfill shareholder expectations

It differentiates with traditional performance indicators, as they surpass mere financial performance indicators by integrating quality and time-related metrics, all while enhancing current processes, both for long-term innovations and short-wave process.

Learning and Growth Perspective. It defines the infrastructure necessary for the organization to foster growth and enhancement over time. Organizational development and progress stem from three primary origins: people, organizational procedures and systems (Kaplan & Norton, 1996). To bridge these disparities, businesses will need to allocate resources towards retraining employees, upgrading IT and systems, and harmonizing organizational procedures and practices.

Figure 1.3: The four perspectives of the Balance Scorecard by Kaplan (2001).

Over time, the Balanced Scorecard (BSC) has transformed from a basic per-

formance evaluation tool into a comprehensive strategic framework for assessing performance (figure 1.3). Connecting KM practices with the four perspectives of the BSC will enrich decision-making and lead to enhanced financial performance for organizations, as it enables to establish causality between non-financial resources and performance, as well as the one between good (or bad) practices and reached (or not reached) goals.

In a nutshell, the reason behind the remarkable success of the Balanced Scorecard (BSC) lies in its capability to connect performance metrics across various categories, including financial and non-financial as well as internal and external factors. When evaluating the efficacy of Knowledge Management (KM) practices, it becomes imperative to gauge their impact on organizational performance, and the BSC can serve as a valuable tool for managers to assess an organization's position in this regard, as affirmed by Gupta and Chopra (2018).
Kaplan and Norton (1996) firmly believed that the financial objectives are the central point around which the targets and metrics in all other scorecard perspectives revolve. In fact, creating a Balanced Scorecard should foster business departments to align their financial goals with the overall corporate strategy. Darroch (2003) reached the conclusion that knowledge acquisition, sharing, and adaptability have an impact on innovation, with the specific note that knowledge adaptability directly influences the financial performance of an organization.

1.6.5 Strategic Performance Measurement: Benefits, Limitations and Paradoxes

Strategic Performance Measurement can have both beneficial and damaging purposes. On one hand, SPMs aids organizations in shaping and attaining their strategic goals, fostering alignment in attitudes and behaviors, and ultimately yielding a positive impact on the overall organizational performance. However, it has faced criticism on various fronts, including its potential to promote counterproductive behaviors, hinder innovation and learning, and demonstrate limited influence on decision-making processes (Micheli & Manzoni, 2010).
Although numerous accounts highlight the effective adoption of the Balanced Score-

card in large corporations, Kaplan and Norton (2001) pinpoint, drawing from their extensive experience in implementing the Balanced Scorecard in various organizations, **design failure** and **process failure** as the two primary causes for its failure in larger companies.

The former, **design failure**, can be due to three main reasons. First, an insufficient number of measures within each perspective, that can result in an imbalance between leading and lagging indicators or between financial and non-financial metrics. The second situation is the opposite of the previous one i.e., an excess of indicators without recognizing the critical few. In this scenario, the organization loses its focus and struggles to establish connections between the metrics. This perspective has been studied by Micheli and Manzoni (2010). SPM has the potential to encourage organizational stagnation and result in "ossification", which refers to organizational immobilization brought about by an excessively inflexible strategic performance management system. A huge number of indicators may cause issues, especially for those companies that operate in dynamic environments. In fact, in these cases a few indexes with simple and clear rules, just to frame constraints, are suggested. This makes it possible to build an adaptive and responsive system.

At last, the failure of selecting metrics that accurately represent the organization's strategy. This occurs when an organization attempts to include all of its Key Performance Indicators (KPIs) in each perspective without filtering to include only those metrics aligned with its strategy. As a result, the organization's strategy remains untransformed into action, yielding no benefits from the Balanced Scorecard. Micheli and Manzoni (2010) and Dossi and Patelli (2010) underlined the importance of distinguishing between operational PMSs and SPMSs. The difference in terminology, implicates a difference in tasks and meaning as well, as they impact at distinct organizational levels and stages.

Process failure (Kaplan & Norton, 2001), is the most typical cause of malfunction of the BSC, and can be caused by a number of situations: insufficient dedication from top-level management; limited engagement of personnel; restricting the scorecard's usage to upper management; excessively protracted development procedures; regarding the Balanced Scorecard as a one-off measurement endeavor; viewing the

Balanced Scorecard as a technology-based initiative; enlisting inexperienced consultants; introducing the Balanced Scorecard solely for compensation purposes. As Rompho (2011) underlies the common element between the aforementioned unsuccessful usage of BSC is lack of effective communication. This implies that the concept may not be clear to all members of the organization, and as a result, some may even express opposition to it.

The limitations cited in the current section can all be addressed if BSC is build and maintained properly, i.e., choosing an adequate number of KPIs according to the strategy main objective, that must be shared clearly through all the organization.

Besides inappropriate design and implementation failure, Micheli and Manzoni (2010) found another paradox: SPM can limit innovation. Some studies affirm that a performance measurement direct to implement strategy solely (*diagnostic purpose* (Micheli & Manzoni, 2010)) could be adverse to innovation. Yet, if SPM System is designed with an *interactive purpose* (Micheli & Manzoni, 2010), it can help companies to orientate within the market, better organize their operations and change the strategic focus, in case it is necessary. The equilibrium between the 'diagnostic' and 'interactive' applications of SPM has significant implications for SPM's potential to actively drive the implementation of change initiatives and innovation strategies. In case of major transformations, the organization should think of SPMS, not just in terms of resetting goals and indicators but also in terms of reassessing the equilibrium between alignment and empowerment. Only by taking this step can the organization create an adaptable system and leverage it for change.

Of course, when SPM System is excessively widespread, infrequently monitored, or lacks differentiation in terms of significance across levels, and when responsibilities are not appropriately delegated, it is very likely to fail. However, even when an SPM System is subject to regular review and adjustment to align with a shift in strategy, it has the potential to steer the organization in a direction contrary to the originally intended one.

To conclude, while SPM Systems undeniably hold significant power, they cannot ensure business performance on their own. They should be considered as integral components of a broader system and employed together with other mechanisms. Even though their designing is challenging and requires multiple attemps, measuring corporate performance is no more a nice-to-have practice, rather a must-have habit, and is regarded as a «tool for power» (Micheli & Manzoni, 2010).

Chapter 2

DATA ANALYTICS FOR THE THIRD SECTOR

Humanitarian aid entity is fundamental, as it saves numerous lives every day, a vital service, which could still be improved. In 2009 Taylor B. Seybolt, International Affairs Professor and Director of the Ford Institute for Human Security at the University of Pittsburgh (Seybolt, 2009), observed that despite some progress in recent years, humanitarian aid operations continue to suffer from inadequate planning and coordination. In recent years, the situation is gradually beginning to improve; more and more models and computational systems are being offered to optimize decision-making processes that meet budget constraints. Nevertheless, to make sure these new technologies truly provide help, an adequate coordination among various organizations is mandatory.
The solution offered by the Response Innovation Lab is to act as a coordinator among the different actors, and to best perform this function, it is necessary to gather a range of information about the "players" in an ecosystem.

As *Discover Data Science*[1] stated, the utilization of data analytics can enable nonprofits to maximize the benefits of their data. Although approximately 90% of nonprofits gather data, nearly half of them do not fully capitalize on this information. The deficiency arises primarily from the absence of a dedicated data analysis

[1]Discover Data Science is a Wiley University publisher that, among others, offers a wide range of articles related to data analytics and data science

team within most NGOs. However, it is crucial for them to tap into the full potential of the data they gather (Discover Data Science, 2023).
Information can be leveraged by NPOs (Non-Profit Organisation) to gain valuable insights and utilize them in order to set objectives and develop initiatives. Generally, collecting and processing data has been found to be useful in this type of context mainly to fulfill three main functions. First and foremost they can employ data for fundraising, by exhibiting their effectiveness to donors, demonstrating the rationale behind existing funding, and enticing new charitable actors as well.
The second purpose is very linked to the first one: marketing. To achieve successful content, it is crucial to ensure that the marketing strategy aligns with the interests and needs of the target audience. Boosting visibility is fundamental to attract new donors.
Third, as for-profit companies enhanced their daily performance thanks to data analysis, NPOs can improve their operations as well, deciding how to implement particular activities and monitoring them over time.

The purpose of the second chapter is precisely to make the reader understand the key role that data analysis and strategy play for the Third Sector, for innovating and implementing new technologies.
It is structured in five sections, aiming to provide a 360-degree perspective, starting with the concept of data literacy in the Third Sector, identifying its main obstacles and providing some insights. Next, the topic of data-driven innovation in the humanitarian world will be explored, from the digital revolution to the definition of innovation. Third, we will look at how NPOs carry out accountability and measure their performance, proposing Kaplan's BSC as a model, and emphasizing the importance of disclosure of organizations' performance indicators. Transparency is the most effective way to attract new funders and retain existing ones. Finally, we will introduce Response Innovation Lab, its mission, the programs implemented to address needs, and its current necessity to innovate.

2.1 Data Literacy in Non-profit Organizations

Nearly every business is grappling with the abundance of data that is now accessible. Nevertheless, in order to fully harness worth, knowledge, and potential that data can offer and ultimately foster a culture within the organization that relies on data, tools and information access alone are not enough. An entity necessitates a solid understanding and proficiency in interpreting and utilizing data, i.e. data literacy (QlikTech International AB, 2021).

Data literacy can be defined as an ongoing process of learning that enables individuals to recognize, comprehend, analyze, generate, and manipulate data to gain knowledge (Sternkopf & Müller, 2018). In other words, it enables people and organizations to use data effectively, approaching it with critical thinking skills. A good level of data literacy is fundamental to identify the future best data practices in order to meet goals. Generally, data literacy is a broad concept, as it considers not only data scientists or data analysts (with the highest level of knowledge), but also «the ability of non-specialists to make use of data» (Frank et al., 2016), which means the ability to create and interpret simple statistics or plots.

Despite its proven importance, data literacy and its potential are still largely unknown to a portion of our society. A research study conducted by QlikTech International AB (2021) has proven that even though the majority (90%) of employees identifies data tremendous potential, only half of them makes data-driven decisions, while the other half still follows their gut feeling.

According to a 2019 research[2], most of the third sector organizations invest in data tools and usage (UNOCHA & Centre for Humanitarian Data, 2019), of which 42% of the respondents feel a significant interest in data by their organization, while the 48% experience a moderate investment. Finally, the last 10% did not feel the NGO where they work invested in data.

UNOCHA and Centre for Humanitarian Data (2019) inquired respondents how frequently their job involves data. 98% of the participants engage in data-related

[2]UNOCHA and Centre for Humanitarian Data (2019) research is based on a survey submitted to more than 1500 NGOs, spread around 111 countries, of which about 1230 (78% of the total) gave complete response. The UNOCHA (United Nations Office for the Coordination of Humanitarian Affairs) together with Dalberg and the Centre for Humanitarian Data interviewed NGOs' staff, an heterogeneous sample of different ages, roles, experience and organization types.

activities to some extent, 70% of whom need it every day. Not surprisingly, the majority of individuals involved in data-related work claim to interact with data constantly, while non-technical personnel are equally divided between who works with data occasionally or consistently. However, researchers argue that this may be due to different perceptions of what is included in data tasks (UNOCHA & Centre for Humanitarian Data, 2019).

Nevertheless, despite the significant potential of data literacy in facilitating social advancement, there remains a notable disparity between this potential and the current level of its application. This gap is attributed to a lack of necessary resources, skills, or opportunities (Sternkopf & Müller, 2018).

Moreover, Bonikowska et al. (2019) highlights the importance of knowing and planning the right skills necessary to embrace data culture within an organization, providing an adequate data literacy training.

2.1.1 Obstacles

According to Sternkopf and Müller (2018), NGOs environment suffers a not insignificant disadvantage compared to business when dealing with data analytics. The huge gap between actual technologies employed and the potential ones is mainly due to three obstacles: limited resources and expertise as well as low flexibility, and consequently fail to grab opportunities (McCosker et al., 2022). In fact, numerous members of Non-profit organizations described that have to deal with **insufficient resources and expertise, along with incomplete, inadequate, or fragmented data infrastructure, systems, and tools** (McCosker et al., 2022).

Part of the UNOCHA and Centre for Humanitarian Data (2019) survey was dedicated to the identification of the challenges when working with data. Results (figure 2.1) show precisely that there is some difficulties when staff need to analyze data or produce some insights and reports. However what stands out is the issue of respondents assessing data and ensuring a certain level of data quality (43%), as well as collecting primary and secondary data. In fact, according to country directors and heads of offices «people don't know what good looks like, and how to get there.» (UNOCHA & Centre for Humanitarian Data, 2019). This represents a huge oppor-

tunity of improvement both for technical and non-technical team members.

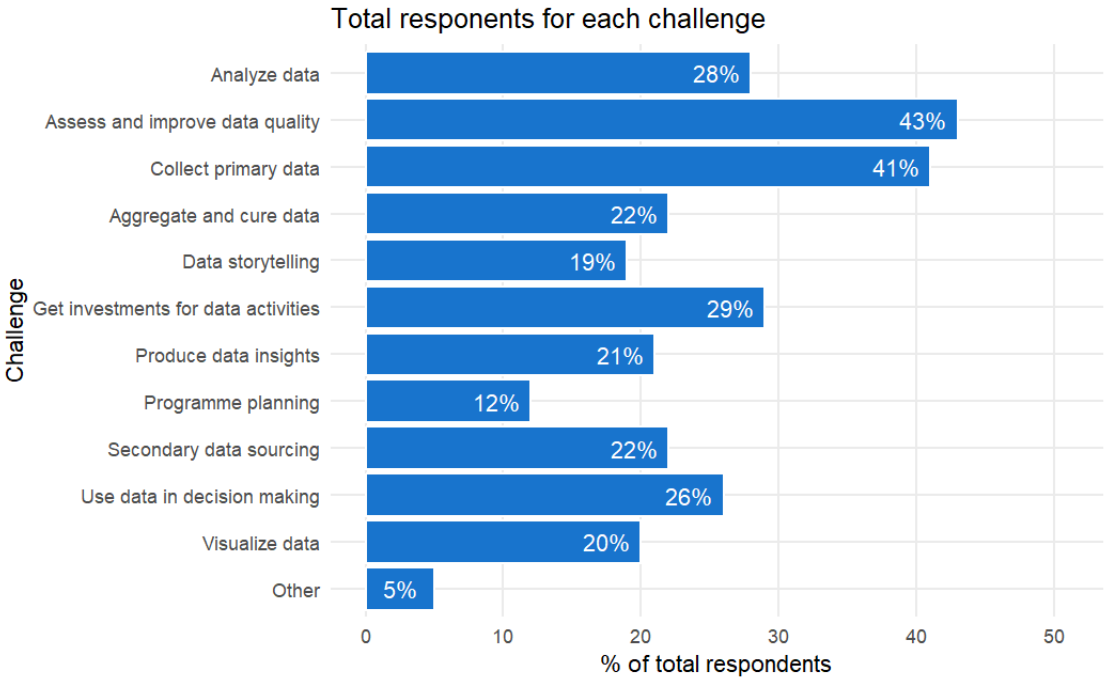


Figure 2.1: Percentages of total respondents for each data challenge (UNOCHA & Centre for Humanitarian Data, 2019)

Figure 2.1 shows exactly what was observed by Bag et al. (2023)[3]: the core obstacle to NGOs ability to implement a digital transformation is funding, which entails consequences in the lack of expertise, tools and flexibility. Bag et al. (2023) analyzed how donors confidence in digital technologies influence vulnerability of NGOs and the humanitarian supply chain (HSC), proving that using digital transformation can improve resilience and promote adaptability, learning, and innovation during challenging circumstances.

First challenge: Funding

The humanitarian environment is a complex community of actors, to which belong donors. Donors include several entities, the UN and its agencies, and other intergovernamental or non-governamental organizations, as well as individuals, founda-

[3]The United Nations Office for the Coordination of Humanitarian Affairs (OCHA), together with Dalberg and the Centre for Humdata, conducted a study on 296 local and international Non-Governmental Organizations involved in several humanitarian activities, that offer support in South Africa and India. The questionnaire was sent in October 2022 and received back by April 2023

tions or corporations, that provide resources to finance a project and guarantee a quick response. Generally each donor focuses on its area of support.
Bag et al. (2023) built a theoretical model based on the application effectiveness of digital technologies in supply, flow and material allocation; finding out that:

1. When donors have confidence in digital technologies, there is a positive correlation between their usage in the procedures of identifying sources, transporting goods, and distributing them in humanitarian aid organizations.

2. There is a positive correlation between HSCs strength and the use of digital technologies

3. When an organization or system has a reliable digital technology governance in place, it can influence the connection between donors' confidence in digital technologies and their implementation in various processes. This means that if donors believe in the governance of digital technology, they may be more inclined to trust the use of such technologies, even if they do not completely understand the technology itself.

Second challenge: Training

The second obstacle to using data as a source of innovation and as a basis for strategic decisions is the lack of training. Some of the digital platforms that make information available are not always user-friendly; as such, they are difficult for anyone to access. They are aimed at a wide audience, not just analysts and directors. Unfortunately, however, due to the lack of basic knowledge to take advantage of such tools, they are set aside.

Third challenge: Data collection and Secondary data sourcing

In order to create data analysis tools, information must be usable. This means that it must be both reliable in terms of correctness and cleanliness of the data, but also collected in datasets or databases that are easily accessible and usable. Almost always, the internal data collection phase is done manually, resulting in very time consuming. In addition, as figure 2.1 highlights, searching for and using third-party data is difficult, mainly due to a lack of standardization in uploading and publishing

them. Such heterogeneity makes the integration of multiple data sources difficult, requiring more time and, consequently, funds.

By creating an environment of trust and implementing efficient governance practices, the full potential of digital technologies can be realized, leading to improved efficiency, responsiveness, and transparency in humanitarian operations. For these reasons, the Third Sector should invest more in «improving trust in digital technologies». By embracing «antifragile» principles (Bag et al., 2023), humanitarian supply chains have the potential to enhance their ability to adapt, be more flexible, and effectively handle unpredictable circumstances, which results in minimizing the overall consequences of emergencies.

2.1.2 How to develop data capability in NGOs

NGOs can enhance the robustness of their supply chains by utilizing digital technology. More specifically, by efficiently managing their resources, promoting collaboration, promptly addressing emergencies, and evaluating the impacts of their actions (Bag et al., 2023).
As we described in the previous chapter, a lot of attention has been paid for Database Management Systems (DBMS) and Data Integration for business. However, not the same focus has been given to practical approaches aimed at comprehending and developing data practices within community sector and civil society environments. Additionally, the potential for fostering data capability in these settings, as a means of advancing data equity, has been almost overlooked (McCosker et al., 2022). Bag et al. (2023), UNOCHA and Centre for Humanitarian Data (2019) highlighted the difficulties organizations have to deal with, when planning to build new data capabilities or renovate existing ones, even though they could create social impact through the utilization, sharing, and innovation of data, as they are in a favorable position to engage with what a communities need. Organizations could simplify operations, analyze and comprehend donation trends or the effectiveness of outreach initiatives, or establish predictive capabilities to support decision-making and provide information. Nevertheless, as McCosker et al. (2022) claim, superior data capabilities do not provide social benefit immediately nor automatically; data capability is one of

the keys that need to be combined with numerous factors and local operations.

«**Data capability** describes the mix of skills and competencies, experience, expertise and resources needed to collect and use digital data in specific contexts [...], relating both to personal attributes or abilities, and technical components»(McCosker et al., 2022). It is essential to know who works with data and the final scope, in order to better address all the steps involved in data analytics. Generally, we could summarize the process in three main stages:

- examining and comprehending data practices in their specific contexts;
- generating outputs from data analysis, thanks to the co-operation of multiple teams;
- fostering both data capability and equity within various data environments.

NGOs and the third sector are adept at involving communities and employing co-design methodologies. For this reason, McCosker et al. (2022) suggest co-design and/or Participatory Design (PD) methods can be a good solution -yet not the only one- for establishing data capabilities in NGOs, even though they could present some difficulties. They conducted a study, through two research projects together with 20 Non-profit Organizations, providing a series of workshops and practical exercises, aiming at addressing gaps in individual and organizational data capability.
The process proposed by McCosker et al. (2022) for building capacity is composed of three main stages, to which we could add a fourth one (figure 2.2):

1. **Exploration** and identification of the so called "pain points". At the beginning it is important to understand the context, and the real problems and needs a given organization has to face. In order to develop an effective and efficient tool, it is important to share all the knowledge and speak the same data language. For instance, it might be the case information need to be stored in a different way to be fully exploited, or it might be necessary to start collecting another information to achieve a certain result.

2. The second step aims at checking data, a sort of **data guide** that clarifies the strategy, necessary given the different roles, experiences and expertise of team members.

3. Thirdly, building a **data visualization and data narrative**. Even with a not wide dataset, a simple data analysis has a lot of potential. It is not necessary to have huge datasets, rather it is crucial to ask the right questions and obtain useful answers.

4. At last, it is important to **revise** the whole analysis together with the metrics used, understanding what was correct and what must be improved. However, as a respondent said, the true challenge of the whole process is the fact that sometimes you don't know what you're missing (McCosker et al., 2022); but this difficulty can be addressed/reduced thanks to team-working and knowledge sharing.

Figure 2.2: Process for building data capability within an organization.

The main objective of this thesis, as well as the one of McCosker et al. (2022), is creating a common language for data practices that mirrors the social value and impact of civil society efforts, rather than commercial interests. This can be achieved through collaboration and self-driven processes, serving as a pathway to expand data capabilities throughout the sector. This also indirectly promotes the elimination of so-called data silos. Fostering "critical" data literacy within non-profit organizations has the potential to enhance the delivery of services, operational efficiencies, and improve reporting. Moreover, there is also the possibility to broaden the reach of data equity and inclusion through community-centric data practices.

2.2 Data-driven innovation in the humanitarian ecosystem

Since 1980s/1990s Non-governmental Organizations have started developing rapidly, especially after the social movements and protests, that characterized the two decades from 1960 to the end of 1970 (Silva, 2022). During that period, depicted by global revolution[4], NGOs demonstrated to be efficient, in some cases even more than public services, providing innovative assistance; for this reason were identified as inspiration for social change. Although the innovation-development pair has been present in NGOs for 50 years now, little interest has been shown in the literature in studying and understanding this phenomenon and the challenges it faces every day. Silva (2022) points out that articles often describe and analyze cases of innovation success that are very specific.

A study research conducted by Silva (2021) on 20 national NGOs proves that most of the times innovation starts inside an organization, supporting members and their work, and just afterward, the body innovate on the outside, with the scope of achieving social goals.

Grasping contemporary viewpoints and reasons behind innovation is crucial not only for guiding organizations in formulating their innovation strategies and trajectories, but also for prompting them to analyze their role in development cooperation, and societal transformation (Silva, 2022). As the author pointed out, there has always been interest in understanding and defining a 'to do list' of best/worst actions when innovating. Even though it is very hard to establish a best-practice guide, the survey (Silva, 2021) revealed that digitalization is a prerequisite for taking next steps and participate in social change.

2.2.1 Digital revolution in the third sector

Interests, capabilities, funding, regulations, and accounting of NGOs are impacted by their diversity in form and scale, which has an effect on their performance, gov-

[4]The period of twenty years in the 1960s and 1970s was described by social movements and demonstrations against injustice, colonialism, and war. After the liberalization movement of the 1980s, the 1990s saw a push for democratization and good governance as a result of the end of the Cold War, which expanded the global support system for organized civil society, especially in the former Soviet Union (Silva, 2022).

ernance, and accountability (Cordery et al., 2023). Likewise, NGOs characteristics impact their level of digital transformation, as well as availability and propensity to technology adoption.

Opportunities and challenges are brought about by the digital transition, unique to NGOs and their stakeholders (whether they are funders, regulators or beneficiaries). On one hand over the past ten years or more, digital platforms (including social media) have transformed civic engagement by offering new ways for citizens to communicate, collaborate, and organize, creating opportunities for NGOs to operate directly in developing countries, in loco. However, on the other hand, as Cordery et al. (2023) mentioned, it is very hard to put in practice certain systems as several times they lack the means, that is, the necessary technologies for this to be possible, «leaving the most vulnerable behind» (Cordery et al., 2023).

A number of obstacles must be overcome in order for stakeholders to understand performance that is not driven by profit. These include the need to engage diverse stakeholders with accountability information, and the necessity to divert resources from other services in order to facilitate accountability and governance.

Digital Transformation (DT) in NPOs

Cordery et al. (2023) identified three phases of digital transformation; clearly each organization is at a different stage, depending on its needs and possibilities.

- **Digitization**: defined as the inclusion of a technology delivery channel and a one-to-one shift in the manner of delivery from analog to digital services; yet the process remains identical. Offering the ability to download a membership application form from the organization's website or uploading the pdf of a report, instead of printing a paper book.

- **Digitalization**: concentrated on potential modifications to the procedures rather than just digitizing the forms and processes already in place.

- **Digital transformation**: cultural, organizational, and relational transformations are highlighted by digital transformation. In other words, it means introducing novel digital services that were not before possible.

Digital evolution is a process that began to take hold way more than 10 years ago. However, just after the Nepal earthquake in 2015, which caused almost unprecedented devastation, many NGOs realized that it would be necessary to start immediately a concrete path toward digitization to support humanitarian activities. In this way, it would be possible to streamline processes, offering a more immediate response. But the road is far from over, and not without difficulties. As the author points out, it is important to keep investigating NGO management and accountability techniques in order to hold NGOs responsible for the effects they have on the beneficiaries and their communities and to provide valuable information for regulatory and policy initiatives (Cordery et al., 2023).

2.2.2 What phase of the "digital evolution" are NPOs in?

Cipriano and Za (2023) research indicates that a tiny percentage of NPOs typically find success with digital transformation (DT) procedures. In particular, as it was mentioned in the first section of the second chapter, the lack of knowledge of the particular preconditions and (DT) value-creation structures of NPOs affects the strategic growth of DT in NPOs, remaining little understood. Examining NPOs functioning in the 2020s (Cipriano & Za, 2023, p 9), the introduction of new technologies has led to an increase in NPOs' DT efforts, when compared to ten years ago. Many non-profit organizations use technology to create more effective programs, strengthen their bonds with people and the community, and take advantage of digital communication via social media and digital platforms. During pandemic NPOs needed to communicate and monitor the situation, providing a rapid response. On this particular occasion, a further technological leap forward was made.

Digital governance is an essential aspect of any company. There have been several discoveries in recent years that suggest there is a relationship between various aspects of digital governance and the elements influencing the growth and well-being of an organization. Through arranging and facilitating, it enhances and promotes participation, gaining new proficient edges. According to Tiwari (2022), the only long-term competitive advantage that an entity can obtain is knowledge; and data is the fundamental component of information.

2.2.3 Data-driven innovation for NPOs

Due to the rise of a new 'innovation agenda' in development cooperation over the last 20 years, innovation in development cooperation is today an emerging field of research (Silva, 2022). Before analyzing the various facets of data-driven innovation for NPOs in detail, it is important to contextualize the concept of innovation in the Third Sector.

Kumpf and Jhunjhunwala (2023) depicted a detailed portrait of innovation and its adoption within Third Sector. Through their research, the authors could state that, typically, innovation must go through a protracted and occasionally difficult process to get integrated into the standard operating procedure, at which point it is no longer considered "new", especially when it comes to innovation within development cooperation organizations. This process is not without its challenges both for decision makers and institutions.

A series of studies conducted by OECD showed that it can be difficult for many organizations to implement new working practices or (developing) technologies. Besides, changes are usually applied to a small part of the body, that is also frequently isolated from the other divisions.

Defining and adopting innovation

Even though there is not a single, accepted definition of innovation in development, it could be described as «a new solution with the transformative ability to accelerate impact» (IDIA, n.d.). In fact the key characteristics of an innovation is exactly the concept of 'novelty'.

One of the main functions of innovation in organizations is to facilitate the transition from exploration to exploitation. A new discipline called **innovation management** is being applied to a number of organizational areas, including policies and programs, partnerships, finance, procurement and, human resources Kumpf and Jhunjhunwala (2023).

One of the most important things to consider when implementing an innovation in a development organization is how to help them become knowledgeable supporters or users of a new technique, strategy, or developing technology.

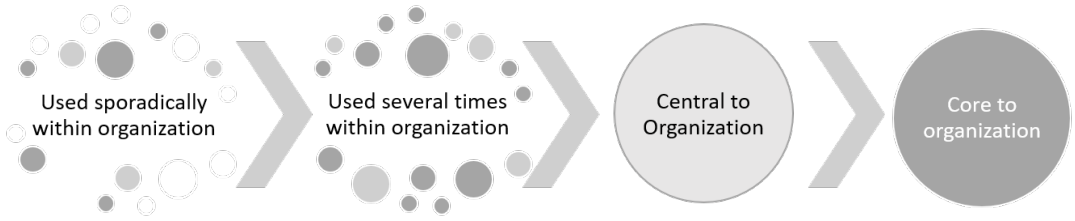


Figure 2.3: Four maturity stages for innovation (Kumpf & Jhunjhunwala, 2023).

Figure 2.3 represents the journey of adopting a new method of operation or integrate a cutting-edge technology, incorporates it into daily operations.
The innovation journey begins with devising the innovation to be made, consulting entities outside the organization, which often offer support. If the design is deemed viable, it begins to be piloted by one or more (limited) units, without being integrated (**sporadic use**). Thereafter, the innovation begins to be used more, but modes and timing of its use are not yet clear (**several uses**). Finally, by mainstreaming an innovative technique or technology, an organization can become an informed or proficient user of it only after it has been tested in various settings and is thought to have relevance and potential within the organization. We distinguish between **central** and **core** use. The former indicates that the organization's work heavily relies on innovation, even though it might not be used to its fullest extent; the latter means it is used to the maximum extent possible. It is fundamental that business is facilitated by organizational elements and high awareness. When applicable and suitable, it is used, and staff members have to be qualified to determine this. However, even when it is core, it does not mean it is default (Kumpf & Jhunjhunwala, 2023).
Even though integrating a method of working into the organization's identity and practices may result in mainstreaming it, this does not imply that everyone must use that method. Every organization has a different path to successfully implement a technology, due to its own characteristics and history, however we provide a simplified example below (fig. 2.4).

By adopting an innovation we mean implementing a *modus operandi*, which is very different from "scaling" a specific solution. Scaling means spreading a tool to multiple organizations, focused on a given results, a very different concept from

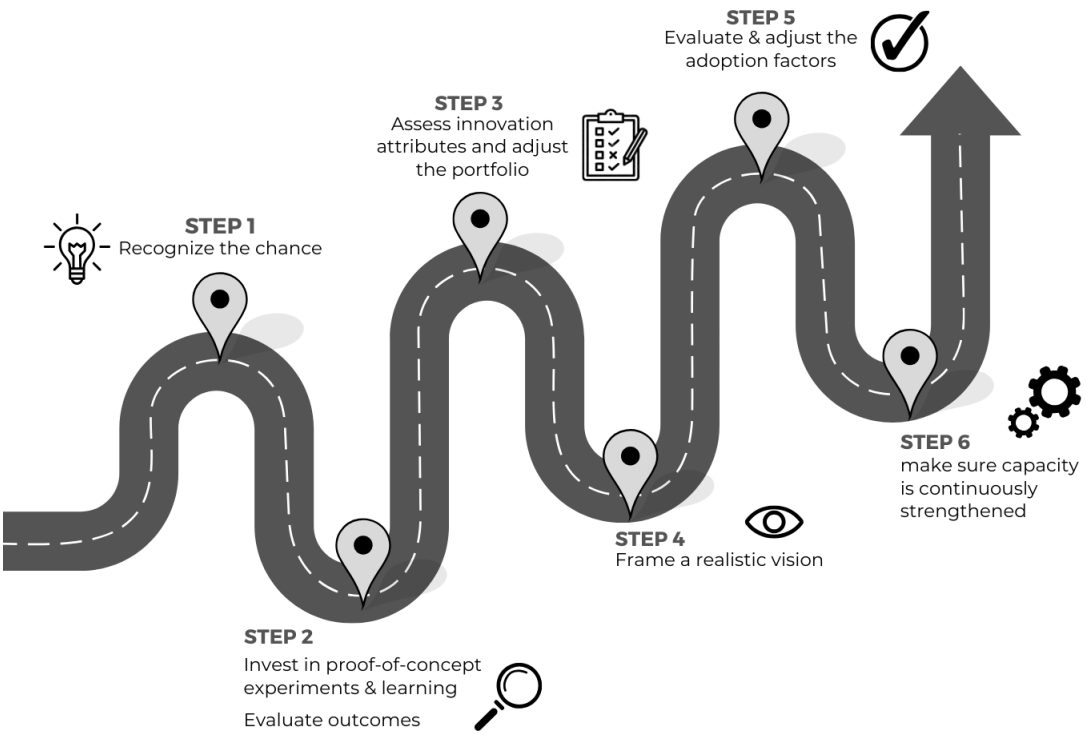


Figure 2.4: Simplified innovation adoption journey in six steps (Kumpf & Jhunjhunwala, 2023).

innovation adoption.

Essential requirements for innovation

Reviewing a number of recent successful innovations in the humanitarian field, Kumpf and Jhunjhunwala (2023)[5] has compiled a list of characteristics that they must meet. The first feature is **relevance**, meaning that the technology can help reaching the primary goal of the organization, maintaining a the external environment in good equilibrium. As we already discussed in the previous chapter, it is important to **measure the advantage** generated and provide evidence of the improvements.

A key aspect worth mentioning is **complementarity**, that is, the fact that technologies should not radically and rapidly replace the staff's method of work. Successful methods have shown that aligning with people's thinking leads to better results.

[5]OECD analysed five public or non governmental organizations. Among others, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), a service offered by the government; Korea's International Co-operation Agency (KOICA) and its Digital Mainstreaming Strategy; The United States Agency for International Development (USAID), that is fostering a development program known as the Collaborating, Learning and Adapting (CLA) framework

The **try-and-adjust** process is fundamental for two reasons. First, it allows to hit the target and find the right equilibrium for the innovation. Second, when multiple attempts are made, indirectly there is a second benefit: increasing knowledge and experience relative to one's field; therefore, we are not only talking about "learning-by-doing", but also "learning-by-studying".
Finally, the new organization model have to be **sustainable** and properly structured.

Data-driven innovation

Among the numerous benefits of thinking and managing digitally is its greater efficiency. Organizations can improve efficiency and effectiveness by fostering an environment that supports and facilitates action through the use of a single source for digital governance (Tiwari, 2022).
Data is the phenomenon of the 21st century. Especially in recent years, the vast amount of information has led to a great development of ML and AI, achieving extraordinary results. For this reason, it is important to take into account some behaviors when dealing with data driven innovation, so that we do not stumble over mistakes. Let's consider it the **"best practice/advice" list**.

- Many times innovation funding follows **hype cycles** (blockchain 2018 or AI 2021, to mention a few) and senior managers allocate funds without knowing if that technology is appropriate and, above all, without having the right capabilities.

- A second issues could be **short-term support** (Kumpf & Jhunjhunwala, 2023), for instance three-five years of funding, or even less. The typical short-term funding for innovation initiatives fails to acknowledge the necessity of scaling up and allocating funds and assistance over a longer period of time. Take your time to try, risk, fail, understand, improve and innovate!

- «**Islands of excellence**» (Kumpf & Jhunjhunwala, 2023). Without people, meaningful innovation is impossible. In fact, it is typically promoted in both local and international development organizations by exceptionally driven in-

dividuals. However, if knowledge is not spread to the whole organization, and promoters will move on, the environment is very likely to regress.

- Recruit **diverse specialist** in your team and combine their abilities and knowledge, in order to achieve a more suitable outcome. Individual projects are good, but teamwork takes innovation to a superior level. After that, structure a guide for all staff members so that they can align and keep up; this way barriers will be eliminated, at least partially.

- Another problem may arise when **overselling** innovation. The process of developing solutions is not easy, however, overestimating the work carried out, is never a winning choice.

- The adoption of decisions about technology or methods need to be supported by strong data, some of which should come from the organization and its partners. There is no chance for adoption without a thorough evaluation of **proof-of-concept experiments** and convincing proof of cost-effectiveness, user value, and other elements that demonstrate comparative advantage. There must be unambiguous baselines, indicators, and targets.

- Make sure you are using **trustworthy** data.

- Recognize and deal with **risk** aversion areas in advance and don't be happy with easy-wins

- Last but not least, finding the correct **metrics to assess** the novelty is fundamental, in order to evaluate and track efforts and positive/negative outcomes.

All in all, the key concept stressed by Kumpf and Jhunjhunwala (2023) is that we do not need more innovation rather better innovation. When data-driven innovations are being implemented, it is important that, before thinking about the technological tools needed, there must be an environment that allows the innovation to take root. This means that people must be properly trained; only by initiating a digital cultural change will it be possible to achieve effective results. Therefore, we can see it as the first strategic move.

As mentioned earlier, the body of research on social innovation fails to offer clear frameworks for the investigation of innovation from the standpoint of development NGOs (Silva, 2022). The author also suggests that, investigating various frameworks can lead to new lines of analysis into the role of imitation, resistance to innovation, and failure in innovation, as well as outside the study of successful innovation. She focused on the fact that there is very little literature on how NGOs are using digital tools to change and improve internally. Cipriano and Za (2023) added that it would be desirable to study a framework for DT adoption in the future.

2.2.4 Strategy: the importance for NPOs

Determining and following a strategy, together with making decisions based on data are items of the 'best-practice guide's' list when innovating. In fact, according to UNOCHA and Centre for Humanitarian Data (2019), 75% of Country directors and heads of offices claimed that they regularly make decisions based on what data shows, while 50% is involved in data-driven programme planning. This proves in a concrete way that data helps (both strategic and non-strategic) planning, a fundamental basis in order to bring about innovation.

It is beneficial for all organizations to adopt a strategy that outlines the value the organization hopes to provide, how it will achieve that value, and how it will be able to maintain itself (Liao & Huang, 2016). NPOs survival is ensured by their organizational tactics, which are strongly linked to the effectiveness of the organization. Their management organization draws emphasis away from financial goals, like making sales of goods and services, rather it does toward social aims and strategies to mobilize society to support them (Moore, 2000). NPOs' distinctive human services are a benefit in a market that is becoming more and more competitive. Differentiation and originality are therefore essential components of a non-profit management plan, that need to be emphasized (Liao & Huang, 2016).

The five case studies, examined by Kumpf and Jhunjhunwala (2023), show how various agencies have taken a **strategic approach** to new technology adoption. Adopting a change means enabling all members of an organization, including partners, to use (when appropriate) a given technology. However, adopting a particular strategy or piece of technology should only be taken into consideration when there

is strong proof that it advances the organization's goals, is reasonably priced, and outperforms existing practices (Kumpf & Jhunjhunwala, 2023).

Strategic approach for innovation: the key role of a clear and realistic vision

The first crucial step in creating an adoption plan is evaluating the technology. Then, the design of a clear vision for implementing the innovation is the second major one. A unified organizational future vision generates enthusiasm and commitment to quicken adoption initiatives (Kumpf & Jhunjhunwala, 2023).
Vision serves as a major source of cultural creation and sustainable management, directing strategy, policies, and tasks, i.e. organization mission. In addition, the goal of a NPO can support innovation as well, and it has been demonstrated to be a crucial intermediary step toward attaining higher organizational performance (Liao & Huang, 2016). However, as vision influences performance and development of a NPO, it is fundamental to explore the precise effect it could produce on Organization's performance.
Innovation efforts, for example, are frequently concentrated on short-term goals and particular location-based difficulties. In order to progress major improvements with partners in low- and middle-income nations, the latter is required. Nonetheless, this concentration frequently results in a lack of emphasis on developing supportive organizational settings (Kumpf & Jhunjhunwala, 2023). Planning broader-range experiments (e.g., at country level) based on new technologies or working methods, maybe with partners, would have a different impact; however, it would require a strong social network, good scheduling abilities, and knowledge of the new technology and of the organization. For this reason it important to have a realistic view of the functioning, strength and weaknesses of the entity, including staff members as well. After due analysis, the question to answer would be: Will this technology help the organization improve the process by improving or expanding my reach?

A well-defined vision provides the organization with enhanced direction going forward, as well as the chance to reflect on the past, evaluate the gaps that need to be addressed, and devise a customized action plan (Kumpf & Jhunjhunwala, 2023).

Strategy and Vision impact on NPOs' Performance

Liao and Huang (2016) conducted a study research trying to understand whether there was a relationship between strategy, vision, and service performance [6]. Results show that there is a good positive correlation between Vision ans Strategy of an organization; besides, both are positively correlated and have a beneficial influence on the Performance of the Services offered by an Organization.

$$Vision \longrightarrow ServicePerformance$$

$$Strategy \longrightarrow ServicePerformance$$

These findings support Porter (1985)'s thesis (included in the competitive strategy model), which suggests that in a market that is becoming more competitive, non-profit human services should prioritize a distinctiveness strategy.
In a nutshell, behind a successful innovation there are a realistic vision (that highlights distinct advantages and limitations), a solid strategy, as well as decision making tool that facilitates the understanding of the ecosystem in which the organization operates.

2.3 Accountability in the Third Sector

The need to report and take ownership of one's actions and their results is referred to as **accountability** (Pärl et al., 2022).
A third-sector organization's management today needs to possess competencies that cover the ideas of transparency, compliance, and responsibility that support the organization's long-term sustainability on the financial, social, and economic fronts. Stated differently, managers and professionals working in the non-profit sector should be guided by the principle of accountability, which combines these three ideas, to take responsibility for the choices they make, the actions they take, the resources they use, and the outcomes they accomplish.

[6] The goal of Liao and Huang (2016) was to examine how NPOs administration is affected by vision, strategy, HR management, and service performance. Five NPOs provided a total of 529 volunteers of different age, gender, and degree level, to take part in the study.

As Martin and Kettner (2009, p. 1) assert, the planning, resource allocation, management, and evaluation of programs by human services organizations all heavily depend on performance accountability and measurement. Performance measurement handles the "how-to", whereas performance accountability supplies the theoretical basis. For human service managers to perform effectively in a world where concerns about performance accountability and measurement predominate, they must grasp both the theory and the practice.

2.3.1 The importance of Accountability for the non-profit sector: Internal and External perspectives

Measuring performance, gathering information, and then analyzing them, are fundamental activities for any type of organization, whether it be for-profit or nonprofit. Specifically, Accountability and Performance evaluation activities for nonprofits have proven to be useful both from the perspective of internal operations and towards external stakeholders.

Internal perspective: Decision-making and organization culture

Harrison et al. (2012) studied the role of accountability and performance measurement for decision making through the 3E framework: Efficiency, Effectiveness and Economy. As accounted many times, both public sector and NPOs core objective is service provision (Pärl et al., 2022), however there must be a trade-off between costs and benefits.

First, it is crucial to make a distinction between efficacy and efficiency. **Effectiveness** is measured by comparing the results achieved with the desired results, whereas **efficiency** is a way to gauge the amount of resources used to generate results or attain inputs-cost ratios. **Economy** can be described as a ratio of Outcomes/Costs, where specific and strict budget constraints are set. The idea behind the 3E by Ramanathan (1985) is to link results to expenditures, so that they can reflect the organization's mission and not only a minimization of costs. The Balance Scorecard, we will see later, was designed for the purpose of providing an exhaustive big picture.

An implication of decision making is budgeting and **resource allocation**. If Inno-

vation A (or Organization A) gets same or even better results at a lower cost than Innovation B (or Organization B), A should receive more resources than B.
Another important internal perspective is **organization culture**.
Performance accountability and measurement (Martin & Kettner, 2009, p. 10) are useful to align staff and give directors a standard vocabulary to utilize when evaluating the efficacy, quality, and efficiency of the services they lead. A proper performance assessment provides a method to identify pain points to be improved.

External perspective: Stakeholders

The goals of nonprofit organizations are centered around the needs of particular groups, and they may rely on grants and funds to carry out their work. This calls for maintaining public trust in an ever-changing environment and achieving intangible goals (Cestari et al., 2022, p. 23). Additionally, multiple authors agree that stakeholders are asking organizations to enhance the quality of the services they provide, particularly where funding and donations are involved (Cestari et al., 2022; Harrison et al., 2012; Kim et al., 2019), demonstrating performance accountability (Martin & Kettner, 2009). In fact, in the last few years we observed a change of route from process- to performance-oriented evaluations of programs and innovations.
Disclosing information has also positive effects on public trust and positive reputation (Becker, 2018) and it allows "outsiders" to better understand (and then believe in) an organization.

2.3.2 Voluntary disclosure of information: effects on trust and perceived quality

Nonprofit organizations engage in voluntary accountability to make sure that they adhere to financial and ethical standards that go beyond legal requirements. This helps to establish the organization's credibility and «send signals of quality» (Becker, 2018).
It is not easy for external stakeholders to evaluate organizations performance (neither for internal), as they provide intangible services many times; sometimes it causes uncertainty. For this reason accountability, especially when voluntary, is ap-

preciated as it helps regulating governance, fundrasing and management.
Becker (2018) studied the phenomenon of voluntary disclosures of NPOs and found out that:

- **Reputation benefits** more from stronger (voluntary) nonprofit accountability initiatives than from weaker ones.
- When it comes to **perceived quality**, better (voluntary) nonprofit accountability initiatives have a bigger positive impact than weaker ones.
- On one hand there is a significant difference between those that disclose information and those who don't. This supports the thesis according to which, poor accountability has a significant negative impact on an organization's reputation and declines in donations.
- However, on the other hand, even if externally certificates seemed to gain better results, the accountability condition (i.e., the use of internal or external certifications) shows no proof of significant statistical difference.

2.3.3 Challenges in the use of Accountability and Performance measurement

Accountability is a complex subject, as it entails a series of challenges that extend beyond budget constraints, the skills of collaborators and the available technology we have seen in section 2.1.
The big issue of measuring success in Non-profit Organizations as well as public sector is made worse by the multitude of stakeholders, each with a different definition of what constitutes good performance (Harrison et al., 2012; Kim et al., 2019). In fact, accountability should be strategically designed in order to consider performance measurement for stakeholders, providing different levels of detail and different measures, according to the public to which it is aimed at.

The amount of time and effort spent assessing performance could be questioned, such as whether the resources -needed to gather, process, and publish data- may actually have a negative impact on an organization's ability to function effectively;

for example when costs of implementation and maintenance are overpriced for the business' dimension and its budget. Another point related to assessment, is giving too much importance to financial perspective. If decision makers give too much importance to numbers and few to actions, they may finally become paralyzed in their thinking and unable to act. A good reporting system properly structured for the mission of the organization, showing the appropriate content is required and could limit this issue (Harrison et al., 2012).

Finally, Sometimes it is not easy to interpret results, as measures may be too complex or because it is not clear what and how to measure. For this reason it is fundamental to state few questions, that must be clear and straight to the point, as well as identifying the key factors influencing performance and outcomes.

2.4 Performance measurement for NPO: a literature review

The managerial effectiveness of a NPO has an impact on donations as well as the organization's ability to survive. As a result, raising both the efficacy and the standard of NPO services has become imperative (Liao & Huang, 2016). NPOs must generate benefits from their operations; nevertheless, the creation of results —which is widely considered to be their primary attribute— depends on their partners and actions. For this reason they can be considered as both public and private at the same time. This, together with the humanitarian scope, generating a totally different organization of internal/external processes, are the two main differences with for-profit companies. The effectiveness of NPOs is multifaceted and cannot be reduced to a single metric, rather we can consider different indicators: for example financial, multiple/single task, and organizational performance.

Both published and unofficial sources of information indicate that the humanitarian sector must adopt a new mindset and approach to bring about significant improvements in efficiency, effectiveness, and impact when responding to complicated and difficult emergencies. This entails implementing innovative strategies in a well-

supported and coordinated manner.
The current section will start by analyzing Strategic Performance Measurement for NPOs by Kaplan, understanding the differences with the BSC for business (chapter 2). Afterwards, we will provide thesis in favour of information disclosure, linked to the concept of transparency. Finally, will be examined the role of Business Intelligence and Data Analytics platforms in the Third Sector.

2.4.1 Strategic Performance Measurement in NPOs

Nonprofit organizations need to monitor their performance, now more than ever, because there are more and more agencies seeking for limited government, foundation, and donor funds.
Kaplan (2001) studied Strategic Performance Measurement in NPOs by establishing contact with a number of organizations and helping them define strategic indicators to measure their performance. Kaplan identified **three main issues** related to performance measurement, not infrequently present in the humanitarian context, that makes it difficult for them to build alternative quantitative indicators of organizational effectiveness.

- NPOs often lack financial assessment, such as profitability indicators;
- Their objectives may not be clear;
- Sometimes they provide intangible services, difficult to evaluate.

For these reasons Kaplan (2001) agreed that, **there isn't a single, all-encompassing model of organizational performance** for an organization to improve efficacy and efficiency. Besides, creating frameworks for evaluating performance is more valuable than attempting to create effectiveness theories.
Both short-term (processes and tasks completed) and long-term (outcomes) measurements are required, providing a balanced method that assist the organization in determining which of the categories it is "doing well" on.

The Balance Scorecard (BSC) for Non-profit

The Balance Scorecard (BSC) was created to help the private sector address shortcomings in the financial reporting model, which is unable to identify shifts in the

economic value of the organization (Kaplan & Norton, 1996). However, there cannot be a BSC without its strategy.
Kaplan (2001) observed that many times it can be very challenging for organizations to define their strategy properly, confusing actions (facts) with their mission; this poses a serious threat. Initiatives should assist an institution in meeting its strategic targets. They serve as means, not goals. The organization's intended output and outcomes should be the primary focus of strategy and performance monitoring, not the programs and activities being carried out. It is important for nonprofit organizations to remember that «**strategy is not only what the organization intends to do, but also what it decides not to do**» (Kaplan, 2001, p. 358).
Like their counterparts in the corporate sector, nonprofits must concentrate their limited finances on a narrow range of goals and stakeholders. Being all things to help everyone, almost always results in unproductive organizations (Kaplan, 2001).

Any performance assessment system must begin with a **well-defined strategy statement**. If not, performance metrics concentrate more on regional operational enhancements than on determining if the strategy is being implemented. Despite this, diverse interpretations of strategy statements for use in daily work can nevertheless result from them. Organizations can minimize or even completely eradicate uncertainty and disorientation regarding goals and approaches by measuring and quantifying their strategies. As they work toward their goal, they become more coherent and focused.

2.4.2 Customer perspective first

To recap what we have seen in the previous chapter (section 1.6.4), the four pillars on which the Balance Scorecard is based are:

1. Financial perspective
2. Customer perspective
3. Internal-Business-Process Perspective
4. Learning and Growth Perspective

Regarding the first item, although it is crucial for survival, we have made it clear that (differently from for-profit institutions) increasing profits/incomes is not the main purpose of the organization, so that it should not be positioned at the top of the pyramid. In fact, a number of nonprofits have moved the BSC's order, such that the **customer perspective** is now at the highest level. For instance, Kaplan (2001) wrote that United Way of America, after implementing the traditional BSC, determined that the financial perspective should be at the bottom and their consumer one at the top. Indeed, charitable organizations should consider putting an overarching purpose goal at the "apex" of their scorecard. The long-term goal of the organization is reflected in the mission. After then, the scorecard's objectives can be focused on achieving this kind of high-level goal.

The relationship a company has with their customer is another point of differentiation with respect to NPOs. The former provides a service to an individual, that pays an amount for it. The latter interacts with two separate subjects: the donor, that supply resources (funds) and the recipients, i.e. who truly receives the service. For this reasons, given that there is no fixed outline for the BSC, if the mission is providing a good level service, the scorecard order for NPOs could be (fig. 2.5):

1. Customer perspective: if recipients are satisfied, funders will be as well.

2. Learning and Growth Perspective: staff development and training, as well as strategic well-thought innovation.

3. Internal-Business-Process Perspective: communication, collaboration and efficiency in process management are key. Through the spread of organizational-wide scorecards, staff members in each department might coordinate their daily efforts to support the attainment of the organization's strategic goals.

4. Financial perspective: always improve decision-making, in order to gain more liquidity and help more people.

In a nutshell, Kaplan (2001) noticed that after the implementation of the correct BSC, the measuring system has changed the organization's focus away from programs and toward the outcomes that initiatives are expected to achieve. Due to

Figure 2.5: An example of Integrated Balance Scorecard for Nonprofits (Kaplan, 2001).

their management of a varied and noncumulative set of activities, it has supported businesses in avoiding the delusion that they have a strategy. It has made it possible for them to coordinate projects, divisions, and people to collaborate in ways that support one another. In other words, all the resources of the organization were aligned to reach organizational objectives.

2.4.3 A six-steps guideline for implementing strategy through the BSC

Defining and carrying out a Balanced Scorecard can be tough, as it requires a long process of revision and adjustments to put in place a medium-term strategy practice. In addition, the mid-term (3-5 years) strategy MUST be aligned with short-term (1-2 years) programs and activities, i.e. tactics. As it is a long pathway, we will provide a practical six-steps guideline for implementing strategy through BSC (Ronchetti, 2006).

1. **Formulate the Mission.** It should be clear, concise, and explain the purpose of the organization. In order to have the most possible influence on its

stakeholders, it should also outline the organization's operational procedures.

2. **Specify the Vision.** The project's vision statement describes, in words and images, what the organization hopes to become in the long run (like five years or a decade). Although mission statements are frequently vague, the vision statement need to present a clear and concise depiction of the intended final state to serve as a starting point for growth tactics.

3. **Carry out a SWOT analysis.** Stakeholder input is gathered and the organization's operational advantages and effectiveness barriers are objectively examined using an analysis of Strengths, Weaknesses, Opportunities, and Threats. This tool's ability to assist a business in identifying easy-to-acquire external opportunities and internal operating strengths is what makes it so successful. Once the analysis is finished, search for important concepts, that seem to belong in a broad group and may fall under more than one area. The next stage of developing a strategy map, which involves using the results of the SWOT analysis to look at the company from the four viewpoints of the Balanced Scorecard, benefits greatly from these strategic principles. The strategic planning team receives useful information from the SWOT analysis that can help resolve other organizational problems in addition to useful knowledge about the organization's operations.

4. **Set up a Strategy Plan.** If on one hand a SWOT analysis provides information about external factors and internal processes, on the other hand a Strategy Plan gathers concepts into a set of strategic themes. These topics are developed into strategies that allow goals and KPIs to be specified and turned into concrete actions. These tactics are created from the views of the customer, financial, internal process, and learning and growth in the BSC model.

5. **Define the Strategic Ideas.** Before moving further with the planning process, the planning team should enquire further about each strategic topic after it has been categorized and placed on the strategy plan. What should be clearly defined is the main concept behind the idea, together with the advantage it would bring to the organization (Ronchetti, 2006). Clarifying "why" a given theme is implemented, helps not losing focus and better targeting its

measures.

Following the development of definitions, the team ought to think over each strategic theme to determine its significance to the organization. Strategic themes may be modified or deleted, wording is constantly changed, and each one perspective should be respectfully challenged throughout a series of meetings to make sure the outcomes capture crucial operating principles that embody the organization's mission, vision, and values.

6. **Determine Strategic Objectives and their Performance Indicators.** The definition of strategic objectives -which outline extremely detailed tasks the business must successfully complete in order to fulfill its mission- serves to operationalize strategic ideas. Establishing strategic objectives alone, though, is insufficient.

   Performance indicators are created to offer success metrics. It is important to distinguish between indicators and metrics or targets that offer reporting performance and measuring requirements. Less accurate, indicators usually follow trends and serve as a gauge for assessing whether a strategic goal is being achieved positively or negatively. In a negative scenario, more research will be necessary to identify the primary cause of the downward trend.

   When more data is gathered, the group of analysts will need to evaluate whether the measures they have defined, accurately reflect the success of the organization. Finally, more thorough study should be performed to create accurate metrics and targets if no new indicators are selected.

2.4.4 Non-financial reports

The effectiveness and efficiency with which organizations address the necessities of their constituents should serve as a gauge of their success. As Kaplan (2001) asserts, financial factors can be empowering or restricting, however they rarely are the main objective in a non-profit ecosystem. Financial reports track historical performance but don't provide much information on how long-term value is created (Kaplan, 2001). In fact, for-profit companies recognized the need for **non-financial measures** to evaluate their performance as well.

Non-profit organizations' performance cannot be determined by how well they stick

to financial budgets, or even by exercising restraints in order to keep real expenses considerably below those allocated, even though they must undoubtedly monitor what they spend and follow them.

Roslan et al. (2017) analyzed the number and type of indicators disclosed by Malaysian organizations in annual reports, to measure their level of transparency and accountability. Indexes are divided into three main macrocategories: (i) balance sheet, (ii) financial, and (iii) non-financial activities.
There are numerous elements to take into account within the non-financial macrocategory, among others:

- **Objectives**, that must be in line with organization's mission and vision
- What **Activities and Programmes** are conducted by the organization
- How each program is accomplished (performance review, achievements, future advancements, costs)
- **Corporate Information** (structure, governance, corporate profile, members and expertise)
- **Contributions** from volunteers or other countries

Roslan et al. (2017) analysis shows that the most frequent non-financial items are the one related to corporate profile and information (82%). Instead, metrics regarding goals, future plans and performance of initiatives, as well as expertise and volunteers are not so frequent (28% - 30%). However, a charity that explains its goals, rules, and strategies in a clear and concise manner while also detailing the activities it undertakes each year is said to be producing effective reporting. Disclosing information related to programmes helps stakeholders understand the benefits society/communities have received, and proves the ability of the organization to remain committed to its goals and mission, and remain sustainable.

2.4.5 The importance of transparency and information disclosure

Nonprofit organizations can obtain funding from a variety of sources, in order to support their operations (Roslan et al., 2017).

One question that is frequently posed, as Zainon et al. (2014) claim, is whether these organizations have been making effective use of the funds they have been given by charitable donations, local funders, and the government. Donors experience misallocation of gifts and knowledge asymmetry as a result of organizations' limited or delayed information release.

Most people agree that effective feedback mechanisms and solid leadership depend heavily on transparency. Both Zainon et al. (2014), Burger and Owens (2010) believe that if donors are confident in the efficacy of NPO reports, then information disclosure by NPOs may draw in new donors or encourage existing ones.

Organizations are not perfect, just like governments and businesses, thus timely access to trustworthy information is crucial for governments, donors, beneficiaries and NGOs themselves, to effectively regulate organizations' initiatives (Burger & Owens, 2010) and evaluate their effectiveness and efficiency (Zainon et al., 2014).

Reliability and accuracy

Sometimes the NGO-beneficiary-benefactor axis contains hidden actions and private information, making transparency a critical problem. But transparency is the precondition for accurate decision making. Despite this, even though the majority of organizations studied by Burger and Owens (2010) claimed to be transparent (85%), just a part of them truly shared **accurate and reliable information**.

Distance

When donors are situated far from the actual place where the organizations operates, making it not affordable for them to frequently visit the project sites, and monitor conditions and results. For this reason, funders would heavily need reports provided by the NGOs.

An additional barrier, due to geographical distance, can arise if the donor lacks

context and cultural understanding of the area and lacks a standard by which to assess reports and accounts (Burger & Owens, 2010), failing to understand part of the metrics, and the reasons behind certain results.

Corruption and ineffectiveness

Burger and Owens (2010) studied 205 NGOs in Uganda, trying to understand why did they avoid to reveal information or provided inaccurate data. Two concepts that emerged, related to lack of transparency, were corruption and ineffectiveness of proposed programs. The unwillingness to provide information when requested reveals insincere behavior, sometimes even leading to doubts about the NGO's honesty. Finally, being transparent means showing failures and shortcomings, allowing both donors and organization members to understand what went wrong, and how to avoid the same mistake in the future. This proves **honesty, credibility and maturity** and avoids misinterpretations that could lead to severe issues when shown.

To sum up, «non-profits that publish adequate attract more donors [...] and financial support from stakeholders» (Zainon et al., 2014). The best way to support an organization is creating a strong relationship with their stakeholders; and the "easiest" way to obtain endorsement is by providing complete, accessible, transparent, fully-disclosed, and relevant information. If NPOs don't meet the needs of their donors, they may stop donating.

2.5 Business Intelligence and Data-analytics platforms

NGO interactions with donors in the public and private sectors are supported and strengthened by digital webs and the related procedural routines. According to Cavicchi and Vagnoni (2023) research, digitalization supported accountability debate by giving the NGO and other relevant parties the tools they needed to gather, process, analyze, and share data regarding the performance of the NGO and its social impact (Cordery et al., 2023). It gave the chance to become more transparent, standardize procedures, and have additional resources available for their fundraising initiatives.

Business intelligence systems also gave executives and decision-makers the capacity for anticipation, which changed the decision-making process into one that was more proactive. In the non-profit ecosystem the main objective is not maximizing profits, rather providing social benefits, therefore finding a way to represent those aims in a BI platform can be difficult, requiring a considerable technological invest. Though it is complex, BI is very useful as it allows for analysing the performance of single areas of interest of the organization.
One of the most common methods of keeping track of performance trends, and whether targets have been met, is the use of **dashboards**. Although they seem like non-complex tools, there is a great deal of work behind them that must be done, to ensure that what is shown is correct.

NGOs often require the development of **platforms** to monitor the progress of a project, for which they invest good amounts of money and time. Unfortunately, however, not infrequently in the request and development of such tools they stumble over some mistakes that limit their use. First of all, if the platform is too specific for the individual project, when concluded, it will not be possible to use the project again and, therefore, it will get abandoned. In addition, a second error is the hypersectorality of the instrument from a knowledge/skills perspective. Assuming that initial training is always imperative, if the background needed to be able to make use of the platform is too advanced, this will greatly reduce its use and end up being ignored by a large proportion of potential users.
One solution to this type of problem is the **generalization** and **simplification of tools**. By creating structures that are less complex to understand/learn, it will be possible to expand use, reaching more and more people, involving users with different tasks as well.

Chapter 3

RESPONSE INNOVATION LAB: INTERNAL EVALUATION SYSTEM FOR NON-PROFIT

The third chapter of the thesis discuss the assessment of the activities of a Humanitarian Aid Organization, Response Innovation Lab, identifying the impact that accountability can have on decision-making activities.

3.1 Response Innovation Lab in a nutshell

The current section is devoted to understand the mission and vision of the Response Innovation Lab (*RIL*), why it needs to integrate the data it has at its disposal, how they are structured and the improvement needed.

3.1.1 History

RIL is a non-profit organization operating in several developing countries, providing support for innovations in humanitarian response. It is a collaborative initiative between World Vision, Save the Children, Oxfam and Civic.
Jennifer Wilde, the founder of *RIL*, came up with the idea while leading the World Vision response to the Nepal earthquake in 2015. She recognized that the existing humanitarian spaces were not open to the newer players like start-ups, social entrepreneurs, and researchers who could offer innovative solutions to the situation. As

a result, she and her colleagues at WV Nepal decided to establish the World Vision Nepal Innovation Lab, a platform specifically designed for collaborative problem-solving (Response Innovation Lab, 2020b).

Given the positive impact the initiative has had, the concept has been replicated in other countries with the help of Save the Children, Oxfam and researchers from George Washington University. Originally, the five founders of the project, which had taken the name Crisis Response Innovation Lab, stated that labs were to be a place where international NGOs, tech companies, along with locals, should be able to meet, share problems, ideas and solutions. A bridge between funders, innovators and communities in need of help. By 2018 *RIL* set labs in several countries, starting from Jordan, Uganda, Iraq and Somalia. In the meantime, the organization has continued improving its services and tools, embracing new challenges to mitigate disasters all over the world, from Asia to Africa and Central-South America (Response Innovation Lab, 2020b).

3.1.2 The Problem

The humanitarian field is facing an immense challenge as the demand for emergency relief, recovery, preparedness, and resilience initiatives rises to an unprecedented level. A staggering number of 134 million individuals across 42 nations were estimated to require humanitarian assistance in 2019, and this figure continues to grow on a daily basis (Response Innovation Lab, 2020c).

Jennifer Wilde said: "The problems arising are complex and more frequent, and as the world's problems evolve and change, our solutions to counteract them should as well." (Response Innovation Lab, 2020c). Basically, the humanitarian sector is being challenged to accomplish more with limited resources, and there is a pressing need to explore novel approaches and methods. Innovation is essential in addressing these demands.

The widespread access to information, advancements in technology, and adoption of creative problem-solving methods brought about by the digital revolution have led to a significant increase in the establishment of tech start-ups, socially-driven ventures, and new non-profit initiatives across the globe. This growth is observed even in marginalized and susceptible communities.

3.1.3 The Mission

The goal of the Response Innovation Lab is to enhance the existing humanitarian system by creating stronger bonds between individuals who implement response initiatives and those who have creative solutions to their problems. RIL Country Labs aim to form alliances that cultivate, experiment with, and expand innovative ideas that address specific issues or obstacles to the provision of assistance and the revitalization or durability of communities.

However, *RIL* main principle is not to stay indefinitely, but rather to address a specific need in the response ecosystem and enhance the local ability to respond.

Last but not least, *RIL* is dedicated to ensuring ethical principles and technical standards in the solutions, projects, and organizations they engage with, all in the spirit of their humanitarian mission. For this reason, the organization integrates the objectives of several Sustainable Development Goals into their projects by addressing specific needs identified in each country: each situation and environment presents its own unique challenges.

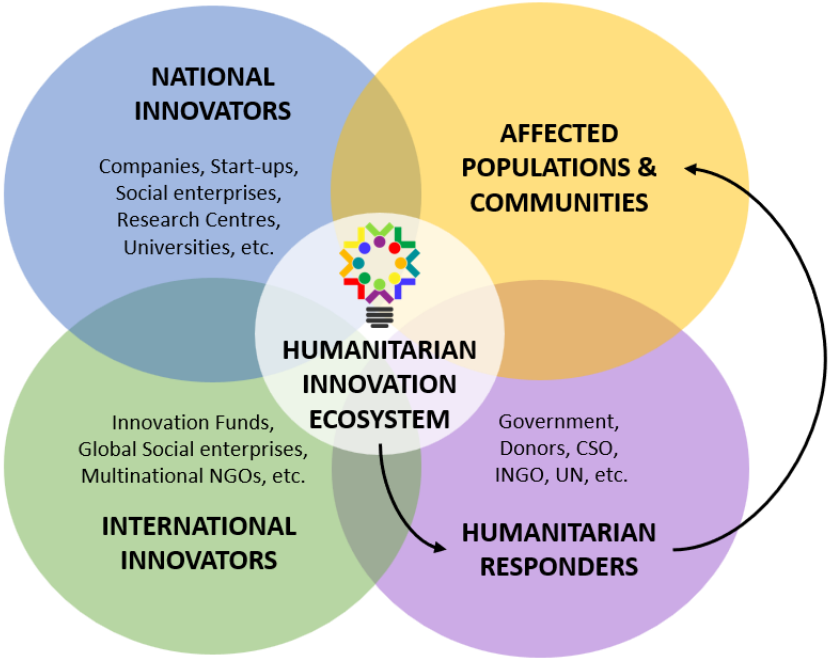


Figure 3.1: Humanitarian response context: how actor interact with each other (Response Innovation Lab, 2020c).

3.1.4 The Functions

RIL labs cater to a wide range of entities engaged in aiding humanitarian crises, such as governments, entrepreneurs, non-governmental organizations (NGOs), academics, community-based organizations (CBOs), and prioritize addressing the needs of the most marginalized individuals. Support is provided to local innovations in their specific environment through the analysis of problems and solutions, by investing in pilot, scale, and eventually bringing the solutions to the market. This approach allows *RIL* to foster a productive and adaptable ecosystem that enhances the innovation capacity within each situation, obtaining better results for communities affected by emergencies.
According to Response Innovation Lab (2020a), the Organization provides three main functions:

1. **Convene**

   "A humanitarian challenge is like a puzzle: no single organization has all the pieces. A convener brings all the pieces together." (Response Innovation Lab, 2020d) The convening function aims to bring together multiple actors operating in different contexts, in order to provide the fastest and most effective response possible. It is a fundamental step, as subjects most of the times find it difficult to interact, simply because they don't have the means to start a collaboration or they don't know each other.
   For this to be possible, all challenges must be mapped, identifying the sector they belong to, the geographic area, and the interventions needed. Next, the challenge is addressed to the proper local or global innovation humanitarian ecosystem. To facilitate communication within the ecosystem, the Challenge Maps are utilized (they will be explained later), allowing for the introduction of innovations and their subsequent impact.

   Afterwards, the process of Matchmaking involves finding suitable solutions that correspond to these specific challenges.

2. **Matchmaker**

   Recently developed by *RIL*, the Matchmaker program is an online platform

designed to link individuals or organizations facing humanitarian issues with proven solutions. Usually, multiple options for the specific context are yield. As a result, the recipients facing a challenge is provided with a Solution Packet which includes different choices, expert opinions, both unsuccessful and successful attempts, enabling them to incorporate additional unique features into the most suitable solution.

3. **Support**

   RIL assists implementers and innovators in a specific humanitarian environment to optimize their potential for implementing effective innovations. This involves connecting them with external resources and experts to enhance their skills in design and management, as well as offering specific tools and training to promote innovation in the context of humanitarian efforts. The organisation also provides assistance to global or local humanitarian requests that aim to establish connections with local ecosystems. In order to achieve this, ecosystem maps created during the Convene function are used by the *RIL*, to reach out and collaborate with the ecosystem. By offering support to applicants throughout the process and coordinating with donors and agencies involved, *RIL* ensures that both the local and global parts of the request can effectively participate and obtain the desired results.

Finally, it is important to monitor the stage of progress of the operations carried out constantly. Having all the information is crucial to be able to offer concrete help while having a limited budget. The role of data is essential to perform all the functions described above, yet quality information are needed.

3.1.5 The Ecosystem Challenge Map

Generally speaking, an ecosystem map is a tool widely used to decompose complex problems, that summarizes and keeps relevant points only, in order to understand the subject.

RIL designed an online interactive tool that enables people to orient in a particular country innovation ecosystem. So as to obtain more detailed information on actors and innovations that belong to an environment, various filters can be applied. The

Figure 3.2: Ecosystem Map: an example of Uganda Energy/Environment map, with the actor that belongs to the Finance - Investment Platform category, from *RIL* website (Response Innovation Lab, 2020f).

objective is to improve and enlarge the *RIL*'s ecosystem mapping information capacity, which facilitates new collaboration between organisations and people. The second goal of maps is to help both outsiders and insiders understand an emergency context, taking advantage of easy-to-use data. Besides, sharing information has an indirect advantage: keeping it complete, correct and up-to-date.

Let's make an example to clarify what the three functions consist in.
Who works to solve humanitarian problems is constantly asking whether there is a better way to do things, someone in another country or region that already faced the same problem and can offer help, a new technology to save time and resources. Still, connecting dots is very hard and not everyone can have the possibility.

Somalia has one of the highest rates of maternal mortality in the world (Response Innovation Lab, 2020e). To grow healthy and safe new born babies need to receive

immunization and be followed by nurses during the first few months. Unfortunately, due to chronic instability plenty of mothers have to leave the country before babies get vaccinated. Healthcare workers need to find a solution to this problem. The *RIL* acts as broker to connect "dots". They contact NGOs, healthcare experts, tech startups both regionally and abroad to find solutions. They then redact a multiple option package and guidance to learn and work with innovators as well as advice on how to pilot, scale up and attract funding.
The best solution found was a company already working in Somalia supporting rural health workers to track immunization through digital tools. By applying this instruments mums and their children could be tracked everywhere and nurses had the possibility to check their status thousands of miles away.
This is just one of the numerous cases we could mention.

3.2 *RIL*: need for data integration

The *RIL* was born to connect actors together, matching challenges, ideas, innovations and funds, as we explained previously.
At the very beginning the *RIL* was interested in mapping the ecosystem primarily for the purpose of reaching as much companies, organisations, universities or public institutions as possible, trying to best fulfill the matching task. The more the actors, the higher the likelihood to find a solution for a damaged community.
Few years later the Somalia *RIL* was involved in a project called RISE[1] to test the effectiveness of ecosystem investments in Somalia, taking in consideration all the connections between different parties (Maxime, appendix A). It was the first time a dataset was meant for analytical usage by the ecosystem. It contained tons of information, which was very useful and provided a high-level of detail explanation, yet data alone cannot tell a story, they need to be manipulated.
The next step the organisation got interested in, was the engagement with Startup-

[1]RISE: The RESPONSE INNOVATION FOR SOMALIA EMERGENCIES (RISE) project has helped improve understanding on the methods to initiate and support a Response Innovation Lab conflict-affected context. It has played a crucial role in enhancing field support and capacity for innovation in collaboration with regional universities and partners in order to provide them tools and methodologies that can effectively tackle the challenges faced by Somalia and promote further progress in innovation.

Blink[2], an Israeli company that developed a ranking algorithm for commercial/for-profit startups. Surprisingly, Somalia, a developing country, entered the 98th position (Maxime, appendix A), just near Kyoto (StartupBlink, 2023), a city located in one of the most innovative countries in the world, Japan (WIPO, 2023).
RIL realized that it was very important to make the information digestible (i.e., analyse data) in order to create an easy-to-understand index. Most importantly, it «generated a lot of attention» (appendix A) and made not only the government, but also national and international actors realize the potential of the ecosystem. This raised two questions. (i) How to find a way to communicate the strength of an ecosystem, its diversity and composition based on *RIL* datasets. And, (ii) how to build a tool which is simple, understandable by anyone and captivating at the same time.

3.2.1 Idea behind the database: upgrade accountability

After its experience with StartupBlink, *RIL* fully realized the potential that good data analytics can have, not only to directly perform convening, matchmaking, and support functions, but also to attract new players. Thus arose the need to ensure a good level of the information collected by the labs and perform an upper-level accountability at the same time.
As reported in appendix A, the **five principles** underlying the new data collection project are as follows:

- **Dynamism**

  Dynamism is the most challenging of the four characteristics. Data should be updated as much as possible, however it is impossible to ensure 100% up-to-the-minute information, especially in a volatile environment as humanitarian aids. Nevertheless, the *RIL* is constantly working to improve this aspect.

- **Transparency**

  The main characteristic of a data-driven decision making process is transparency. Providing a crystal clear vision enables a good organisation gover-

[2]StartupBlink serves as a globally recognized startup ecosystem map and research center that is dedicated to discovering and promoting the progress of startup ecosystems worldwide, driving their development.

nance, by spreading a common understanding of the strengths and weaknesses of a given environment. Sharing the data available make it easy for external actors to participate to the organisation business and get involved in the dynamics. This translates into greater reliability and consequently also a likely increase in investors and funders.

- **Impartiality**

  The concept of impartiality is linked to transparency.
  Data analysis in itself fosters objectivity. Results are not based on assumptions and beliefs, rather they confirm or reject the initial hypothesis or quantify the target of the research. Accurate data allow a question to be answered while remaining as neutral as possible, providing concrete evidence in favor of the outcome obtained, which makes an organisation trustworthy.

- **Efficiency**

  Efficiency is demonstrated in two different respects. In recent years, budget constraints are tightening due to an increasing number of humanitarian or environmental crises. Knowing in real time the sector that needs the most aid, as well as knowing that a country is well equipped for a certain thematic area, makes it possible to optimize the spending of money. In addition, this greatly facilitates decision-making, reducing implementation time.

- **Quality control**

  Quality assurance is important to understand whether and where data is incomplete, and in case some actors or thematic areas (e.g., Nutrition or Media and Communication) are missing, we need to know if the organisation did not map them or is simply not relevant in that particular context.

The new SQL-based database wants to make it easier for local actors to enter the system, to «make sure all sectors are engaged, to bring non-traditional types of structures (like private sectors, social enterprises, academia) into the ecosystem» (appendix A). Once the dataset is complete, we should be able to answer the following questions:

- What are the characteristics of our network?
- How can the Response Innovation Lab communicate its diversity?
- What is the quality level of organization activity across countries?
- «Can we demonstrate an improvement in that [country]? How did we contribute?» (appendix A)
- Is the equilibrium between efficiency-effectiveness and economy respected?

3.3 *RIL*: from simple data collection to data integration

As anticipated in the previous section, the RISE project has brought out the importance and need for data analysis. However, for this to be possible, it is necessary to have a database. The challenge of grappling with a vast amount of unorganized data becomes apparent, when crucial information is scattered and difficult to locate. Ineffective data presentation exacerbates the problem, hindering a clear understanding of the insights hidden within the data. The lack of proper organization and presentation not only leads to confusion but also impedes informed decision-making processes. Additionally, without a clear understanding of data interactions, valuable relationships and patterns remain undiscovered, limiting the potential for meaningful analysis. Addressing these issues is essential for harnessing the full potential of data and unlocking valuable insights for informed decision-making.

3.3.1 The System for Lab Information Management and Evidence (SLIME)

The Response Innovation Lab has started conducting data collection and analytics on humanitarian innovation in 2019 from all of the labs using a system known as the **System for Lab Information Management and Evidence (SLIME)** (Response Innovation Lab, 2023a).
It consists on an Excel file, one for each country in which the organization operates.

During the initial phase, they decided to begin with Uganda and then replicate the model in Iraq, Somalia, and all the other Labs, up to Yemen. Each file has the same spreadsheets structure, so that it can be easily accessed by all members. We represented the structure of the two main tables we are interested in: Ecosystem and Innovation (fig. 3.3); Other spreadsheets are present in the model, but are out of the scope of this thesis, so they will not be represented[3].

Therefore, *RIL* has introduced Excel as a **crowdsourcing** tool, that ensures **fair-quality** inputs from who was in charge of entering data; usually *RIL* staff members. Excel **streamlines** the process of gathering information, making it easier to check of individuals' data collection across various labs or ecosystems. By maintaining quality standards, the tool ensures that the data collected is reliable and accurate, enabling meaningful comparisons between different research environments. This advancement not only enhances the efficiency of data collection but also facilitates a more comprehensive understanding of diverse ecosystems, fostering collaboration and knowledge exchange across scientific communities.

Drawbacks and limitations

Despite being widely utilized and very intuitive, Excel is not without its drawbacks. First, its «**lack of dynamism**» (appendix A) and inability to capture time dimension; in fact, it is not possible to track changes as it replace old with new information when modifying the dataset. Second, Excel's manual data entering and manipulation process can **take a long time**, particularly when working with huge datasets or intricate computations. Third, even though it is considered a very flexible app, **human error** is a danger that cannot be eliminated, leaving it open to errors that could go undetected without careful examination.
These drawbacks highlight the need for more sophisticated instruments and systems, like SQL.

[3]Other spreadsheets are meant to represent the characteristics and the advancements for what concerns Challenges, Matchmaking, and Support functions the *RIL* carries on.

3.3.2 The System for Management of Information and Lab Evidence (SMILE)

In 2023 the Response Innovation Lab decided to overcome Excel limitation and invest in a new process of data collection: **The System for Management of Information and Lab Evidence (SMILE)**.
Based on data obtained by U-*RIL*[4] teams and content contributed directly by organizations and innovators through online forms, SMILE is an online searchable directory of humanitarian innovation system players and innovations in Uganda (Response Innovation Lab, 2023b). The directory is build on a SQL-based database with Web-interface, that is particularly useful in situations where precision, efficiency, and real-time data updates are needed.
The new platform is divided into three main pages to provide a 360-degree view of *RIL* network and activities.

1. **Data entry form**. From the website it is possible to collect data of organizations, referrals, innovations, *RIL* support and convener activity.

2. **Dashboard**. It is divided into tree main sections: Ecosystem (i.e., Network), Innovation, Convener. Each dashboard contains some plots that aim at showing the diversity of the network or innovations at a high level of detail.

3. **Data Analysis**. The page contains an interactive analysis on Power BI, that access and evaluate the *RIL* Network, as it is crucial for carrying out all the activities and pursuing the mission.

SQL, that means Structured Query Language, has the structure of a relational database management system (RDBMS), used for data storing. SQL strength is its **multidimensionality**, as it makes use of several connected tables - we have already seen it in chapter 2. This can be done with Excel as well, but in a very limited and more complex way.

The reasons why SQL is a winning choice

SQL is a powerful tool, yet it should be used only when it is needed and appropriate for the your scope, as it requires a lot of effort and resources in order to be built

[4]U-*RIL*: means Uganda *RIL*

and implemented.
A point that has already been stressed is the need of the Response Innovation Lab to perform a more effective data-driven evaluation of its environment, meaning that it need to be able to compare ecosystems over time and between each other. For this reason a dynamic database is required.
On one hand Excel is very easy to implement, as well as intuitive and not cheap, and those were the main reasons why at the beginning it was chosen. The *RIL* initiative has expanded fast, connecting with a number of organizations, more than 1600 in Uganda alone; therefore, in a long-term perspective, dealing with thousands of rows is **safer** with SQL, as you prevent human errors of data entry. However, the two most important strengths ensured by SQL are **collaboration**, making it easier when multiple individuals need to work together and consult data and **dynamism**. The latter is fundamental for *RIL*s as they need more than a on-time calculation, rather they aim at showing how a process/an environment is evolving over time.
Finally, as mentioned above, in our scenario more than one table needs to "work together". Besides, we need rules and authorizations as there could be data-display restrictions depending on who is the end-user.

Maxime Vieille, *RIL* Global Director, affirmed «One of our main priorities will be to use this new system (and its future Power BI integration) to better analyze our data and generate more useful information to various stakeholders» (Maxime, appendix A). In fact, SMILE comes with a few fundamental analytical tools that aid users in comprehending the structure of Uganda's humanitarian innovation ecosystem as well as the activities of U-*RIL* (Response Innovation Lab, 2023b), but we will see it later.

The SQL data integration project is a long journey that can be divided into two main stages, a short- and a long-term phase, where the the second depends on the achievement of the first one.

1. A **Short-Term objective** that consists of:
   (a) building and implementing SMILE for U-*RIL* as beta tester;
   (b) optimize database queries (*try-and-adjust process*) so that it requires the lowest maintenance (*sustainability principle*). The more accurate and

reliable the output, the more rules are needed;

(c) connect SQL server to Power BI for better data-driven analysis and evaluations;

(d) make sure everyone and understands its functioning, and the key concepts behind the tool (*training process*).

2. The **Long-Term objective** consists of «**scaling up** both the SQL database and the Power BI tool to all the labs» (appendix A), as soon as they are ready to receive the innovation and funding allows.

3.3.3 Spot the gaps

The *RIL* is doing a good job regarding digital transformation, especially considering the costs involved and the skills it requires. Obviously, this is a process, a journey that needs its time to be implemented and transition from being an optional to a core tool for the organization.

Nonetheless, below we provide some insights that could be useful in the future for *RIL* and all those non-profit organizations engaged in similar activities. At the moment, not all labs are aligned on the implementation and updating of data. This is due to various factors, such as the absence of a proper lab in some cases, with occasional pop-ups or affiliates (meaning *RIL* does not have its own office), or the locations/collaborations that have been initiated recently. However, precisely because they have been recently initiated, it might be beneficial to start cultivating a data culture right from the beginning.

Currently, it is not possible to make a temporal comparison of how the ecosystem of a country has evolved over time and verify the validity of the tool in this regard for research purposes. However, once ready, this will be possible thanks to the SQL database, which will provide a certain level of dynamism.

Given the nature of the activity, it would also be interesting to have geographical dynamism, providing a comprehensive view of the operational scope of organizations. This understanding of where they can operate would enable a more immediate response in times of need, aligning the country's requirements with the potential response from various entities.

Besides, from the data collection side at times could arise some difficulties. First, there may be limitations in loading information, as it can be challenging to obtain, especially concerning small-sized organizations. Second, though *RIL* already tries to quantify the contribution for every organization, whether it is monetary or not, it would be more useful if they could be able to find a measure that can quantify it numerically or according to some levels/ranges, so that different projects and programs can be compared.
In conclusion, another idea could be provided by combining financial and non-financial indicators within a BI platform, in order to have a 360-degree view, simultaneously monitoring both economic sustainability and the ecosystem in which an organization operates.

3.4 *RIL*: Accountability model

The *RIL* mission is creating stronger bonds between individuals who implement initiatives to address humanitarian issues, and those who have creative solutions to their problems. In concrete terms, it can be translated into two sub-objectives:

- generating more comprehensive networks in the countries where they operate
- bring innovations and build relationships with actors

For the Response Innovation Lab to improve innovation and support management, it is necessary to evaluate their programs and performance both for internal and external purposes. However, in order to produce reliable results that make a positive impact, the organization has to answer some questions first.

1. Who is the target, i.e. the "customers"?
2. What are their characteristics?
3. What service are we providing them?
4. What level of quality is our service(s)?
5. What goals have been/will be achieved?
6. What resources are necessary? How much do they cost?

The client of RIL are organizations or individuals (1), that lead projects with the goal of bringing innovations to a community with a given challenge. *RIL* offers economic and technical support (3) to those actors. However, to answer the most part of the queries, it is necessary to compute nonprofit performance. As Lee and Nowell (2015, p. 301) studied, authors usually take a wide range of viewpoints, each of which focuses on a distinct stage of the value-generation process; from inputs (i.e., the necessary resources), to outcomes and value accomplishment, through organizational capacity, as well as network and relations legitimacy.

The *RIL* gathers information relative to the ecosystem in which they operate. The ecosystem can be defined as all the organizations with which *RIL* operates, each one with a set of characteristics and acts as convener or matchmaker (2). It keeps track of the innovations, their goals (5) and technical area(s), the actors involved and the stages, the financial and non-financial support allocated (6), and the impact, that should be proved by the project leaders and/or *RIL* staff. Finally, the actual impact will be then compared with the projected outcome, to assess the performance of the project (4).

3.4.1 Humanitarian Network Analysis

As proven in the previous chapters, the performance of the activities carried out must also be assessed from a non-financial perspective[5]. Therefore, together with Max Vieille, *RIL* global director, we attempted to measure the contribution that the organization provides. *RIL* does not directly engage with communities but assists organizations in implementing their innovations. Since the Organization focuses on providing services, quantifying the quality of those services is an essential concern. The effectiveness of *RIL* aid depends on the relationship management with stakeholders and other actors, and the trustworthiness reputation. For this reason, it is crucial that the network is strong and well-developed, meeting a set of

[5]The research study by Waniak-Michalak and Zarzycka (2015) on financial and non-financial information disclosure, led to the conclusion that non-financial information is more important to donors -The sample taken into consideration for the study was located in Poland- when deciding whether to make a charitable donation, and that donors hardly ever utilize organizations' financial records in the funding process. The organization's objectives and project descriptions are the most crucial pieces of information.

requirements that we will explore in the following sections.

3.5 The Activities' Performance Indicator

As Maxime Vieille, *RIL* Global Director, confirmed, in the humanitarian world in the last 20 years there has been a «major push for evidence-driven solutions, by generating data about the innovation produced, that demonstrates actual effects». What is problematic for an organisation that work as connection generator, as Response Innovation Lab, is «measuring the impact in the long-run. Up to now, only qualitative data has been produced, like surveys, testimonials of different actors. But, they are not enough to make people understand the true effect an intermediary can bring on». They need to be integrated with quantitative data that support how the organisation is evolving. For this reason, the simplest way is generating an Index: The Activities' Performance Indicator.

3.5.1 Data collection and structure

The *RIL* is still working on the development of the Web-interface for the SQL database, for this reason they provided us the countries' datasets for our further research. Nevertheless, the data used are complete and verified, and for the sake of the thesis, they contribute with the same level of detail that the SQL database would have provided.

The SLIME data in current use is mostly an inventory of organizations that are part of response-level humanitarian innovation ecosystems (Network), along with the innovations and challenges that have been identified. The *RIL* also tracks the work that their labs do in linking the organizations and supporting the innovations to respond to the humanitarian challenges.

As figure 3.3 shows, the core element of the data-driven evaluation, Organizations, to which may be linked one or more innovation(s). The two tables are linked through a many-to-many bi-directional relationship between the Organization Code (`Ecosystem_Sheet`) and the `Primary Innovation Owner` (`Innovation_Sheet`), that correspond to an `Org Code`.

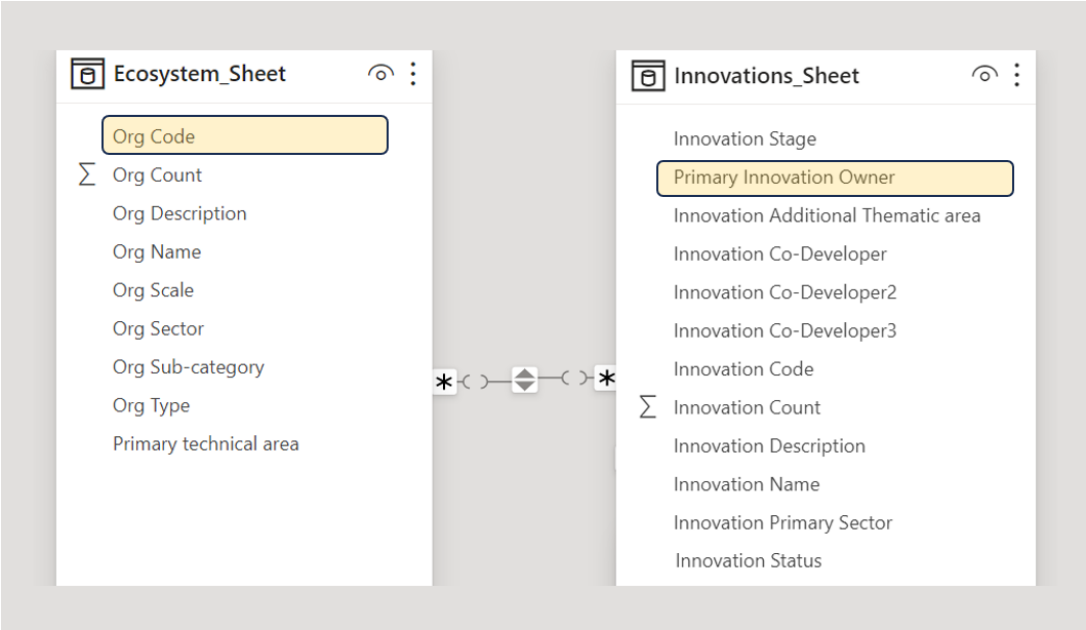


Figure 3.3: The figure represents a many-to-many bi-directional relationship between Ecosystem and Innovation tables -that are the two main excel spreadsheets-, where the key is the Organization Code (author elaborated).

The dataset we will be using in the following sections is the `Ecosystem_Sheet`, which contains the characteristics of the Organizations:

- `Org Scale`, indicating whether the organization operates at a local/national or multi-country level;
- `Org Type`, that specify whether it is a donor, NGO, public, for-profit, academia, social enterprise or UN;
- `Primary Technical Area`, that specifies in what field the organization is involved. For the sake of thesis we had to reduce the number of categories from more than twenty, to 13, grouping them by macro-sector.

3.5.2 Goal and Research Questions

The *RIL* needs to evaluate its activities as supporter, convener and matchmaker, proving its diversity and inclusivity. As long as their activities are influenced by the organizations they operate with, they need to evaluate their network. The Activities' Performance Indicator main objective is:

OBJ1: *Evaluate the performance of a country network and understand where to intervene to bring about improvements.*

The audience targeted by the indicator is diverse, with different backgrounds, skills and knowledge, including managers and coordinators, researchers, data analysts, as well as operators. Therefore, a second objective arises:

OBJ2: *The indicator must be understandable to anyone, as the target audience is diverse. The target are both internal decision-makers and collaborators, as well as external organizations/individuals approaching the humanitarian aid system of a country.*

The analysis of the organizations forming the ecosystem in which *RIL* operates addresses the following questions.

RQ1: *What is the performance of the country XX? How can it improve?*

RIL acts as a facilitator among various stakeholders to bring innovations to countries/regions/small areas in need. Therefore, the goal is to have a broad ecosystem, but at the same time, balanced. This led to a second question:

RQ2: *What characteristics should a balanced ecosystem have? What parameters and targets?*

3.5.3 Methodology

To build the indicator, we used as reference the country Uganda, as its dataset is the most extensive and comprehensive available. Additionally, the SQL-based data integration project has been initiated, with Uganda serving as the beta tester, benefiting from the dynamism of the database.

Assumption: The Ugandan ecosystem is at a good level (so far, good results have been achieved in terms of innovations[6]), but there is still room for improvement.

Step 1: Features identification

To evaluate a Network, it is necessary to identify and understand the characteristics of the organizations/institutions that are part of it. Therefore, three main attributes

[6]In the last six years U-*RIL* helped bringing 522 innovations in Uganda, linked to the 135 Challenges, and counting 3003 convening projects.

have been selected: (i) Organisation Localization, (ii) Organisation Type, (iii) Organization Main Thematic Area.

Organization Localization. It represents the scale of the organization, that is, the level at which it operates:

- *National* including country-level or sub-national institutions. As it is not easy to distinguish between who can work at a national or local level, we decided to merge the two categories.
- *Global/Multi-country/Foreign.*

Organization type. Seybolt defines the community providing humanitarian assistance as a dynamic and intricate system where various units cooperate and interact to generate a variety of outcomes (Seybolt, 2009). Those units can be of various type: people in need, national governments, UN agencies, enterprises, as well as for-profit and non-profit entities. From *RIL* data we identified seven types of organization:

- Social enterprises
- For-profit
- UN
- NGO
- Public sector
- Academic
- Donor

Organization Main Thematic Area. This is the primary sector for which an organization can offer its support. As you can see below, the number of categories has been reduced to thirteen to avoid excessive dispersion of levels and facilitate the construction of the indicator.

- Operations/Programme support, including Engineering, Infrastructure, IT & Digital, Media, Communication, Camp Management, Displacement Programming, Monitoring Evaluation Accountability and Learning (MEAL)

- Livelihoods, including among others Cash Transfer Programming, Social Protection, Financial Inclusion, (social) Entrepreneurship
- Environment, including Energy, Alternative fuels, Environmental protection/conservation
- Food Security and Agriculture
- Health
- Education
- Nutrition
- Economic development
- Human rights and Legal
- Social protection
- Water Sanitation and Hygiene (WASH)
- Shelter and Non-food items (NFIs)
- Transversal, including Disaster Risk Reduction, Emergency Logistics, Early Warning Systems, Refugees displacement and Internally displaced people (IDPs), Gender, Youth, Women, Disability & Inclusivity, Peace-building, etc.

Step 2: What are the target values?

The indicator is based on proportions and weighted averages, for which we established some target values and ranges, to evaluate each of the three features. The current paragraph wants to explain the motivation behind the choice of certain proportions for our features.

Organization Localization.
OBJ: Make the country (Uganda) more self-sufficient, by reducing (yet not eliminating) the number of foreign organizations, increasing local ones. In fact, as mentioned previously, *RIL* goal is to «enhance the local ability to respond» (section 3.1.3).

Besides, analyzing the percentage of innovations, the contribution of local organizations is significantly higher than foreign ones (80.5% National – 19.5% Global/Multi-country/Foreign).

Target values: 75% National, 25% Global/Multi-country/Foreign

Organization Main Thematic Area.

OBJ: The thematic area must be as diverse and inclusive as possible to provide a complete and customisable service. Each country has different needs and challenges, so it is not possible to define a target level for each category to aspire to that would be the same for all countries. However, it is necessary to establish a minimum threshold -for each level- for the goal to be satisfied.

Target values: each category $\geq 2\%$

Organization Type.

OBJ: It is not possible to expect that all types of organizations are present in the same proportion, or just setting a minimum target, for various reasons, primarily due to their unique characteristics.

UN. UN Agencies are present in limited quantities compared to other types of organization; in fact, exist 15 UN specialized Agencies.

Social Enterprise. Social enterprises play a crucial role, especially in developing countries. Some researchers (including Del Giudice et al. (2019)[7]) suggest that they bring innovation with a positive impact on the communities, providing significant added value to communities, by «leveraging new economies and building wealth, environmental system».

Public sector. Even though it is considered a developing economy, Uganda is evolving and growing rapidly (real GDP +6% YoY), and the local and central public sector is actively engaging in the development of innovations, often through partnerships with the private sector. It has been shown that such partnerships significantly increase trust and community engagement when the results are positive (Magoola et al., 2023).

[7]Del Giudice et al. (2019) studied the effect of the presence of 142 social enterprises in several emerging countries.

Donor. As seen in Chapter 2, funds are necessary to implement and sustain innovations. However, they cannot be the majority component, as we need innovation "creators" and "implementers".
For-profit and *NGOs*. Currently, these are the most common types of organizations in the Ugandan ecosystem, accounting for 24.8% and 42.5%, respectively. Despite their noble mission, such a high percentage of NGOs within an ecosystem poses the risk of over-dependency by local communities (Sharma, 2023). The relevance of both these entities in the humanitarian aid sector is well-known, as are the partnerships they establish to achieve high-level results (MacLean & Brass, 2015). The distribution of humanitarian aid is frequently outside the purview or capabilities of traditional humanitarian players in a world where humanitarian crises are becoming more complex and frequent. For this reason, businesses and corporations have increased their involvement as possible collaborators in relief operations for the needy (Hotho & Girschik, 2019), offering positive opportunities.
Therefore, the index suggests a balance between the two.

To conclude, the main goal for what concern organization type, is ensuring a more balanced representation of for-profit and non-profit organizations, encouraging businesses (both social and traditional), so that the ecosystem gradually becomes more self-sufficient. It would be unrealistic thinking of an autonomous country, neither developed countries are, but at least an effort should be made to push in that direction.

Target values are distributed as follows.

Step 3: Do all variables carry the same weight?

It was chosen to assign different levels of importance to our three variables:

40% Org Type + 40% Org Localization + 20% Org Main Thematic Area

As explained earlier, the scope of action (Org Main Thematic Area) of organizations is variable among ecosystems, but mostly over time; for some countries, for instance, it might be more unbalanced than in others, sometimes due to geopolitical conditions and momentary needs that arise.

Organization Type	Target (%)
UN	2%
Social enterprises	20%
Public sector	9%
Donor	8%
For-profit	28%
NGO	28%
Academic	5%

Table 3.1: Organization type target values

For organizations like *RIL*, which provides organization, matchmaking, and convening services, it is important to have entities internally that reflect multiple thematic areas. At the same time, given the typical unpredictability of the sector, allocating greater or equal weight to the other two variables could overly negatively influence the indicator.

After understanding the motivations, let's calculate the indicator.

Step 4: Building the Activities' Performance Indicator

First. The proportion (p) is calculated for each category (c):

$$p = \frac{\#organizations}{total} \tag{3.1}$$

Second. Each category is evaluated accord to its target (t):
How far are we from the ideal target?
In order to understand how far or near the value p is from the ideal value t, we need to compute the distance d.

$$d = \left| \frac{p}{p*} - 1 \right| \tag{3.2}$$

Third. For what concern Organization Localization and Type, the output (y_i) takes different values on a range of five levels(1-5), according to the distance (d).

$d = [0, 0.2)$: $y_i = 5$

$d = [0.2, 0.4)$: $y_i = 4$

$d = [0.4, 0.6)$: $y_i = 3$

$d = [0.6, 0.8)$: $y_i = 2$

$d = [0.8, 1)$: $y_i = 2$

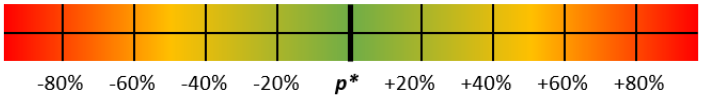


Figure 3.4: Graphical representation of the distance, with the five levels. Red corresponds to "bad", while green is "good" (author elaborated).

The micro-indicators for Org Type (I_{type}) and Localization ($I_{localization}$) are computed as simple averages, where N is the total number of categories:

$$I_{type}, I_{localization} = \frac{\sum_{n=1}^{N} y_i}{N} \tag{3.3}$$

Fourth. Given a target $t = 0.02$, the Organization Main Thematic Area obtains the output y_i as follows:

$p \geq t$: $y_i = 0$

$p < t$: $y_i = 1$

The micro-indicator for Org Main Thematic Area (I_{them}) takes values from 1 to 5 according to the number of "missing" or underrepresented categories:

$\frac{\sum_{n=1}^{N} y_i}{N} = 0 : I_{them} = 5$

$\frac{\sum_{n=1}^{N} y_i}{N} = \{1, 2\} : I_{them} = 4$

$\frac{\sum_{n=1}^{N} y_i}{N} = \{3, 4\} : I_{them} = 3$

$\frac{\sum_{n=1}^{N} y_i}{N} = \{5, 6\} : I_{them} = 2$

$\frac{\sum_{n=1}^{N} y_i}{N} \geq 7 : I_{them} = 1$

Fifth: The Activities' Performance Indicator (APInd). We combined to-

Country	Org. Count	I_{type}	$I_{localization}$	I_{them}	$APInd$
Uganda	1659	4.1	4.0	4.0	4.1
Gaza	189	2.6	4.0	4.0	3.3
Jordan	226	3.3	2.5	3.0	2.9
Yemen	75	2.1	4.0	1.0	2.7

Table 3.2: Indicator results.

gether the metrics with a **weighted average**:

$$APInd = 0.4 \times I_{localization} + 0.4 \times I_{type} + 0.2 \times I_{them} \tag{3.4}$$

The indicator can take values in range from 1 to 5, where 5 indicated a good performance, while 1 a bad one, that certainly needs a urgent intervention.

Figure 3.5: 1-to-5 stars indicator (author elaborated).

3.5.4 Testing the Indicator

The indicator has been tested on four different datasets representing the networks of Uganda, Gaza, Jordan, and Yemen. The four labs were established at different times, and therefore, each is at a different evolutionary stage. Results are shown in table 3.2.

Results interpretation

Performance is defined in terms of network diversity according to *RIL* standards. But, how can indicators be interpreted? Let's recap the first research question (RQ1), that is actually divided in two sub-questions: (i) *What is the performance*

of the country XX? (ii) *How can it improve?*

Let's take Uganda as example.
(i) *What is the performance of Uganda?* According to the rating system, Uganda performance can be considered "Quite Good", with a score of 4.1.
(ii) *How can it improve?* Or better, where do we need to intervene? To answer this question, however, indicator results alone do not provide a complete answer. In fact, a reporting system in Power BI was built to provide a higher level of detail, understanding where do the network lack (figure B.1).
The analysis shows that:

- On the Organization type side: We need to attract more Donors as well as the Public Sector entities; but also focus more on Social Enterprises.
- On the Organization localization side: Engage more National/Local organisations
- On the Organization main thematic area side: Fund/train, or provide support in general, to Shelter-and-NFIs projects, as well as interact and bring to our network actor that operate in this sector

More detailed results can be found in appendix B.

3.6 Accountability managerial implications

The use of accountability tools and reporting has proven to be important for the *RIL*, both at central and local levels, as it has led to a series of managerial implications that influence organization's decisions and choices. In particular, we have identified four areas of impact, namely service provision, resource allocation, corporate mindset and stakeholders trust.

Service provision

As we have previously explained, accountability activity is crucial because it allows for the organized and systematic tracking of both organizations and their associated activities, thereby facilitating easy data retrieval. The idea of having to search

for information among hundreds or even thousands of projects (looking towards the future) and then analyzing them without the assistance of Business Intelligence (BI) would be unthinkable and highly time-consuming, not to mention costly. Therefore, *RIL* and other NGOs (Mackrell and Mcdonald (2014), for example) have decided to invest in a new integrated BI model to innovate their accountability and reporting methods, following the example of many companies. The result is increased efficiency in providing services and potentially greater effectiveness, as costs are monitored more seamlessly and comprehensively.

Resource allocation

Data-driven decision making helps *RIL* reflect on the use of funding, the performance of the innovations or challenges implemented, and learn from data results.
Performance accountability and measurement allow human service providers, like *RIL*, to respond to the six questions listed above. In fact, *RIL* can determine which programs produce what outcomes, with what kinds of partners and at what prices, by combining performance data with the information of the organizations. Integrated Reporting enables Human service administrators to plan, create, and carry out more effective, efficient, and high-quality programs with this kind of information at their disposal.
The BI should render an high-level view on how healthy or unhealthy an organization ecosystem (relative to a country) is, facilitating the decision-making process to decide the type and amount of resources to invest for each innovation, in order to optimize social impact, both when the support provided by *RIL* is non-financial (training, entrepreneurship programs, advertisement, ...) and financial.

> «[...] Apply innovation resources and impact in a healthy ecosystem. Whereas if it is not healthy, we need to draw more support and help it in more human-centred design, do more training and invest in entrepreneurship programs.» (Maxime, appendix A)

Performance evaluation is important both to assess what has been done so far and to make strategic medium/long-term decisions. In fact, BI allows anticipating any future needs that may arise and bridging gaps, for example, in cases there are few

organizations addressing a specific sector, the country manager should take action to create links with organizations operating in that field.

Corporate mindset

Reporting represents a crucial element in the creation of a cohesive and aligned corporate mindset. It serves as a fundamental tool for monitoring and communicating the economic health of the company, enabling all team members to have a clear and shared understanding of financial performance. Through accurate and timely reports, it is possible to track the achievement of goals and results, providing a comprehensive overview of activities undertaken and successes achieved.
Furthermore, reporting is essential for monitoring the progress of ongoing projects, identifying any challenges, and making timely corrections. Transparency in reports contributes to creating a work environment where everyone is aware of common goals and motivated to work together for the organization's success. Besides, reporting provides an opportunity to evaluate and optimize the available network for the company, enabling the identification of strategic partnerships, pinpointing potential synergies, and enhancing the overall capacity of the organization to leverage its resources.
In summary, reporting emerges as a fundamental tool for creating and maintaining an aligned corporate mindset, based on awareness, collaboration, and the common goals achievement.

Stakeholders trust

Disclosure of information, both financial and non-financial, represents a crucial element in the context of the third sector. This practice not only provides fundamental transparency but also contributes to establishing and enhancing trust with external entities. This transparency not only strengthens ties with existing stakeholders but also reinforces the organization's reputation, creating fertile ground for building new relationships. The increase in trust from external entities is crucial for the organization's image and can have positive impacts on collaboration opportunities, partnerships, and investments. In summary, accurate and comprehensive disclosure of information, both financial and non-financial, is a key strategy to promote trust

among external stakeholders, improve the organization's reputation, and expand possibilities for engagement with new partners.
An example of this is the indicator developed by StartupBlink for Somalia commissioned by *RIL*. After revealing the potential of an ecosystem, there was a lot of curiosity, and several new entities approached, contributing their support. An objective set by Max Vieille, Global Director for *RIL*, generating attention to humanitarian innovation ecosystems, providing global level analysis. To achieve this, it is necessary to provide evidence of what has been done so far, evaluating the projects based on both goal attainment and incurred costs. As Maxime Vieille suggests, information generated should be both «provocative and easy-to-understand at the same time, like StartupBlink». Integrated Reporting presents itself as a comprehensive instrument for gathering, connecting, and displaying data regarding value creation, by observing and respecting the five characteristics mentioned in the previous section (dynamism, transparency, impartiality, efficiency, quality control). This is important especially for *RIL* as its work depends considerably on the relationships and collaboration with stakeholders and other partners.

Finally, based on this study, several helpful advice with regard to choices concerning accountability actions can be made. According to the current research study and other authors, among others Mackrell and Mcdonald (2014), Martin and Kettner (2009), and Waniak-Michalak and Zarzycka (2015), Non-profit Organizations' managers and directors who do not currently engage in voluntary accountability activities should carefully consider whether to start.

CONCLUSION

As explained during the course of the thesis, data is increasingly being recognized within NPOs, despite facing numerous challenges, including financial resource constraints, lack of skills, technological gap, and difficulties in data acquisition. Accountability and performance measurement are utilized to being a vehicle for internal communication, but also to improve legitimacy among external stakeholders, by disclosing information. Organizations can impact stakeholders through reports and reporting, and in turn, they can learn from them to better understand how they create value. However, to ensure that there is true value creation, it is necessary for the organization's objectives, mission, and capabilities to be clearly defined.
RIL is continuing with its digital transformation process started a couple of years ago, thanks to a series of actions implemented, including the development and integration of an SQL-based database with a web interface, which will be fully integrated with the BI system soon. Currently, the project has been tested in Uganda; the medium-term goal is to extend this accountability system to other countries where *RIL* operates. The main goal of the accountability is to reveal tendencies, understand strengths and weaknesses of a country, improving the decision-making process and generating attention to the humanitarian world. In fact, the organization decided to complement financial performance indicators with measures aimed at assessing key non-financial activities to provide quality support, i.e., network goodness indicators.

Before going into the study's implications, a few limitations should be pointed out first. The results and recommendations of the case study research are restricted to the environment of the case organization and are based on the management's subjective perspectives, making it impossible to generalize the findings. The sub-

jectivity of the parameters and targets, as well as methods, used in the research makes it difficult to generalize the same model in different contexts. Additionally, the datasets for the study consisted of only one year for each country, representing a further constraint for our research as we miss dynamism, i.e. an evaluation of the analysis over time.

Every humanitarian aid is distinct, and the results of a particular study may not directly apply to other situations. Nevertheless, the current research can serve as a starting point for other organizations, which can adapt/modify the analysis to meet their specific needs.
In addition to the technical and logical insights presented within the research, the crucial takeaway is to convey to the public the concrete importance that accountability and performance measurement have not only for the survival but also for the progress and innovation of NPOs. Undoubtedly, building an accountability management tool represents a significant investment of resources, but it can make a tremendous difference in organizations involved in providing humanitarian services. With a limited budget and the need to attract stakeholders of various kinds, from donors to public institutions, private companies to NGOs, analyzing activities and disseminating results has multiple positive effects. Firstly, it can help improve the services provided and the allocation of resources, align the mindset of staff members (ensuring that everyone has a clear understanding of both the strategy and tactics employed to achieve it), and ultimately enhance transparency, which has a positive impact on external relations.

Lastly, by conducting this study, we intend to establish a foundation for future research on NPOs' digital futures and innovations in the filed of information systems for non-profit.

Appendix A

INTERVIEW TO *RIL* GLOBAL DIRECTOR

Below you will find the transcripts of the interview conducted with Maxime Vieille, *RIL* Global Director.

(M=Maxime; I=interviewer)

I: When has *RIL* started this process of digital transformation and accountability?

M: First of all, the process came gradually. Initially we started mapping our ecosystems[1] primarily to connect actors together. We knew that if somebody came and ask "who do we need to bring together to talk about challenges related to Water Sanitation and its response?". We knew who to speak with: a particular NGO, another private company, and so on. The same goes for implementing solutions. So, at the beginning the data collection process was a simple matchmaking and brokerage tool. Early on, we had a project called RISE to test the effectiveness of investments in Somalia, and it build a very thorough mapping of the ecosystem, including all the connections between the different parties. This was the first time we had a dataset meant for analytical usage. The problem is that we had tons of data, most of which were connected with maps, however information wasn't presented in a very good way so it was very difficult to be used. A few years later we engaged with a company

[1]Ecosystem: Maxime defines an Ecosystem as the set of actors operating within a country.

called StartupBlink[2]. They built a ranking for innovation and startup ecosystems according to a number of criteria, not for humanitarian actually. It turned out that Somalia entered the ecosystem in the 98th position, which was surprising, as it was at the same level of Kyoto in Japan. It generate d a lot of positive attention and made us think of Somalia as solution exporters, not only an ecosystem that need to import solutions. The fact that when you had a ranking made so easy for people to understand the positioning, we realize that making the information digestible and easy to understand was very important. Three years ago we started thinking how to use data and communicate the strength, diversity and composition of an ecosystem in a way that we can have conversations with people about it, by giving a simple entry point, at least for this type of users.

I: You already had an ecosystem map. In what ways have you thought about improving your accountability?

M: Exactly, we already had an ecosystem map and did a study based on the bubble maps, that has no analytical information. Based on the feedback we had from our users, like having information displayed in different ways and getting more understanding of the actors in the ecosystem, we decide to start thinking of a new accountability method and way to provide information to our users.

I: As far as data collection is concerned, what difficulties have you found in your journey? And, has the data collection process evolved over time?

M: Yes, it is evolving. We started with an excel spreadsheet that has improved over time, but it was constraining. There are a couple of challenges. First, the ecosystem is dynamic, there are new startups appearing/disappearing every month; in fact in Uganda we have pretty significant staffing that allows us to stay current. Of course not perfectly, but good enough. In other countries it is more difficult, with the risk of having outdated dataset. The way we are tackling this issue is to try to facilitate data maintenance, making it little time consuming as possible. This is why we are migrating to an SQL back-end. People from Labs were asking for a form entry to be used easily and everywhere, also from their phone, so that every time they had

[2]StartupBlink website: https://www.startupblink.com/

information relative to an organization they could be able to update it easily. The second issue of using excel is that it isn't a longitudinal database; you are replacing always old information with new information, being unable to track changes. This is another motivation for us to migrate to SQL. The usage of very simple data entry form together with a simple indicator will allow us to make a big step forward. Being able to say that, for instance, our ecosystem diversity was 3.5 and now 4.2 means that everything is working properly, whereas if we went backward in localization from 4 to 3, we need to know what is the issue and why are we seeing that change. This will add a lot of value, enabling us to perform a comparative analysis both between labs and different periods in history.

I: How would you describe the new "data analytics" project? What are its characteristics?

M: I would say its main goal is promoting transparency, as well as efficiency. For what concern our network, we do collect data from external sources, so they are not manipulated, impartial. Another characteristics is dynamism, being able to update information as much as possible. The other use is quality control, pointing where the dataset is incomplete. By having a report that says that there is no health actors for example, that should be a prompt for the team to understand where to intervene and extend the network, or simply enrich the dataset as that information was not mapped.

I: Is the tool conceived more as a means to attract new stakeholders (NGOs, donors, etc.) or as an internal gauge of assessment?

M: It's both. The goal is to generate attention to the humanitarian ecosystem, by providing information that is both easy to understand and provocative at the same time, like StartupBlink. If we are able to open the conversation with new actors, they may be interested in applying innovation resources and impact in a healthy ecosystem. Whereas if t is not healthy, we need to draw more support and help it in more human-centred design, do more training and invest in entrepreneurship programs.

I: What are the short and long term objectives regarding the project?

M: One of our main priorities will be to use this new system (and its future Power BI integration) to better analyze our data and generate more useful information to various stakeholders in the Uganda ecosystem. However we will look forward to scaling up both the SQL database and the Power BI tool to all the labs.

I: Let's change a bit the topic. Do you find it difficult to make staff members understand the importance of data?

M: I don't. I think in the humanitarian world there has been for many years a major push for evidence-driven solutions. You always have to demonstrate the impact and be able to generate date of what you do. It is expected in the humanitarian world. What is problematic for us is HOW to measure the long-haul impact, as an intermediary. In the short term it is easier. Up to now, only qualitative data has been produced, like surveys, testimonials of different actors. But, they are not enough to make people understand the true effect an intermediary can bring on. In the long run we need some quantitative indicators to measure our impact, to make sure that all sectors are engaged and that we brought also non-traditional types of structures (like private sectors, social enterprises, academia) into the ecosystem. So, the big question is: "Can we demonstrate an improvement in that ecosystem?" and "How did we contribute?", both when there is a positive and negative impact.

Appendix B

THE ACTIVITIES' PERFORMANCE INDICATOR: RESULTS

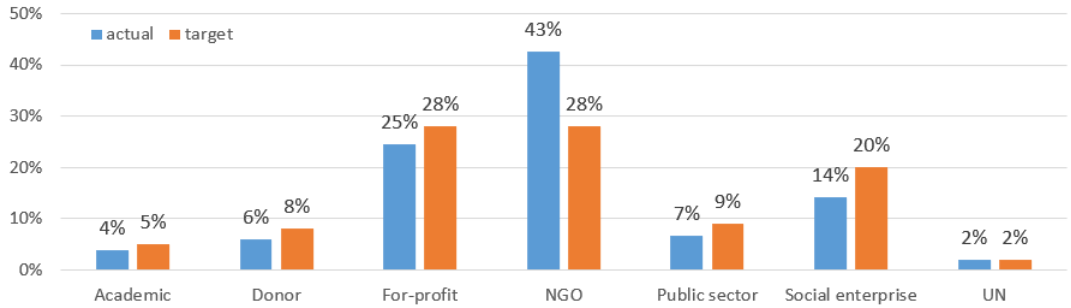
Below you will find the detailed results of the indicators we tested in Chapter 3 (table 3.2) for the four countries: Uganda, Gaza, Jordan, Yemen.
Results are presented in four different tables -one for each country-, where for each indicator are displayed the actual value (%), the target (%), the distance[1], and the rating [2] for each category.

[1]The distance can take both positive and negative values. The former indicates that there is a major/minor excess of a given category, whereas the latter a lack.

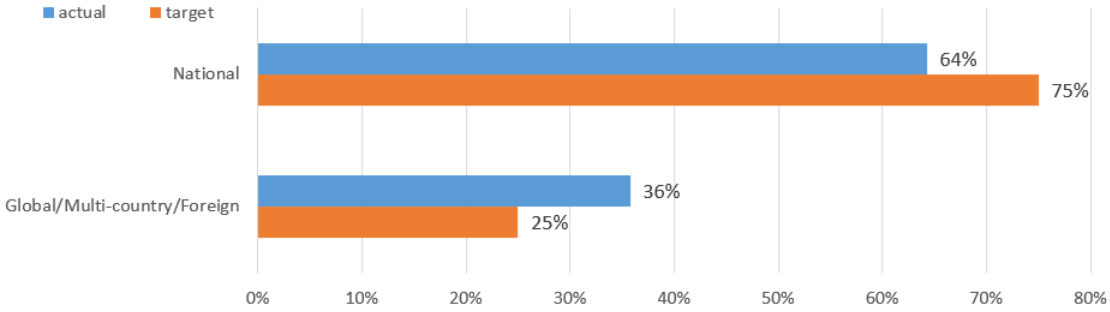
[2]The rating takes value 1-5 for I_{type} and $I_{localization}$; while {0,1} for I_{them}, for the reasons explained in chapter 3.5.3

Uganda					
Indicator	Category	Actual (%)	Target (%)	Distance	Rating (1-5)
Organization Type	Academic	4%	5%	-0.23	4
	Donor	6%	8%	-0.24	4
	For-profit	25%	28%	-0.12	5
	NGO	43%	28%	0.52	3
	Public sector	7%	9%	-0.26	4
	Social enterprise	14%	20%	-0.29	4
	UN	2%	2%	0.02	5
I_{type}					4.1
Organization Localization	Global/Multi-country/Foreign	36%	25%	0.43	3
	National	64%	75%	-0.14	5
$I_{localization}$					4.0
Organization Primary Technical Area	Economic	4%	>2%		0
	Education	8%	>2%		0
	Environment	11%	>2%		0
	Food Security Agriculture	9%	>2%		0
	Health	9%	>2%		0
	Human Rights	3%	>2%		0
	Livelihoods	13%	>2%		0
	Nutrition	6%	>2%		0
	Operations/ Programme	15%	>2%		0
	Protection	3%	>2%		0
	Shelter & NFIs	0.2%	>2%		1
	Transversal	15%	>2%		0
	WASH	3%	>2%		0
I_{them}					4.0

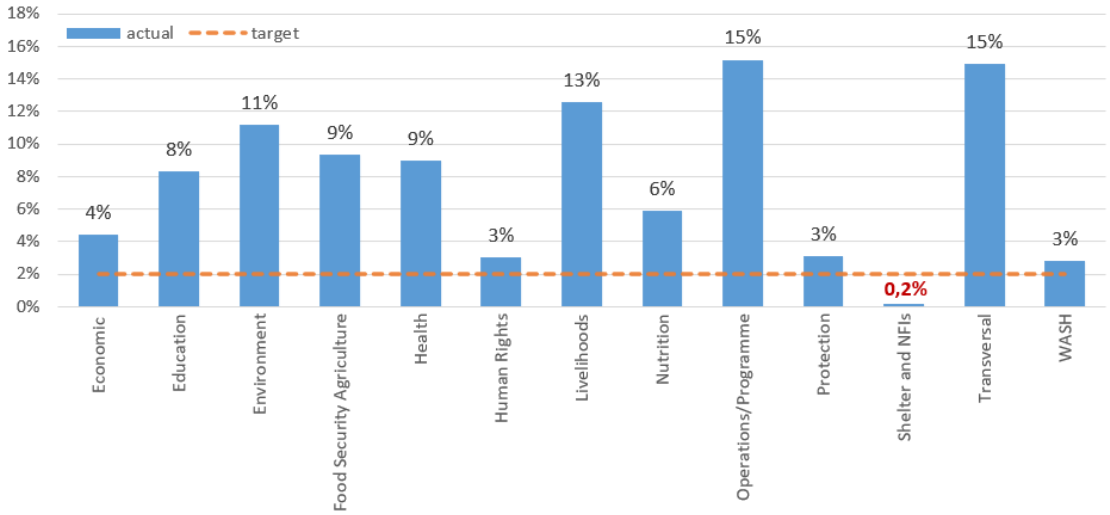
Table B.1: Results for Uganda ($APInd = 4.1$).



(a) Organization type



(b) Organization localization

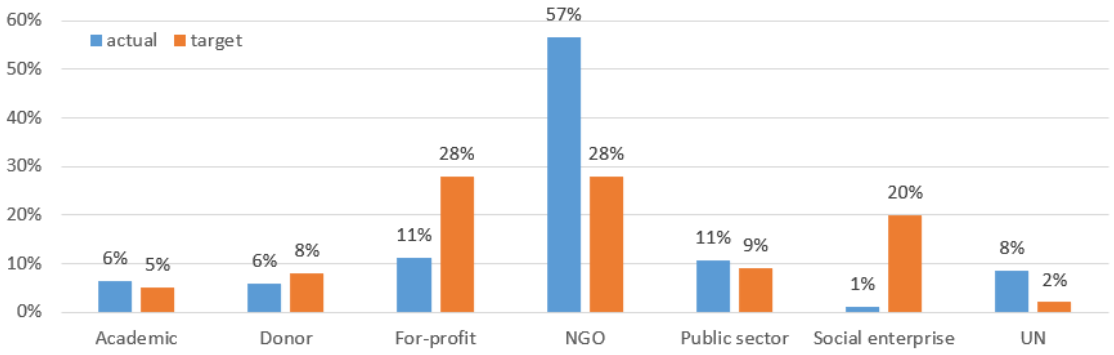


(c) Organization primary technical area

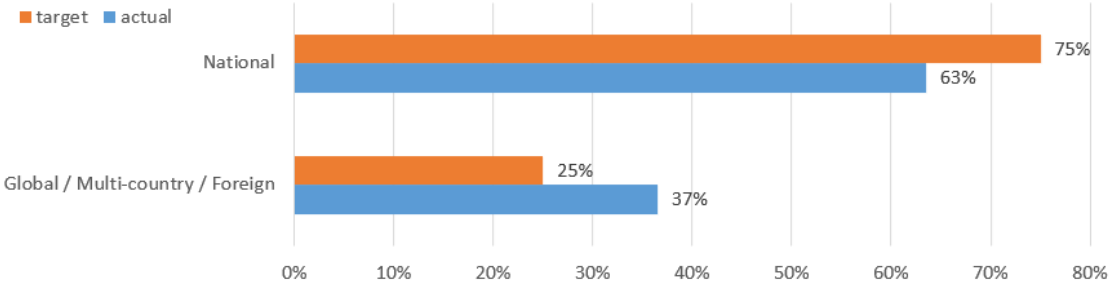
Figure B.1: The three bar graphs represent Uganda network analysis.

Gaza					
Indicator	Category	Actual (%)	Target (%)	Distance	Rating (1-5)
Organization Type	Academic	6%	5%	0.27	4
	Donor	6%	8%	-0.27	4
	For-profit	11%	28%	-0.60	2
	NGO	57%	28%	1.02	1
	Public sector	11%	9%	0.18	5
	Social enterprise	1%	20%	-0.95	1
	UN	8%	2%	3.23	1
I_{type}					2.6
Organization Localization	Global/Multi-country/Foreign	37%	25%	0.46	3
	National	63%	75%	-0.15	5
$I_{localization}$					4.0
Organization Primary Technical Area	Economic	7%	>2%		0
	Education	14%	>2%		0
	Environment	4%	>2%		0
	Food Security Agriculture	10%	>2%		0
	Health	14%	>2%		0
	Human Rights	7%	>2%		0
	Livelihoods	11%	>2%		0
	Nutrition	0%	>2%		1
	Operations/ Programme	11%	>2%		0
	Protection	8%	>2%		0
	Shelter & NFIs	1.6%	>2%		1
	Transversal	7%	>2%		0
	WASH	5%	>2%		0
I_{them}					4.0

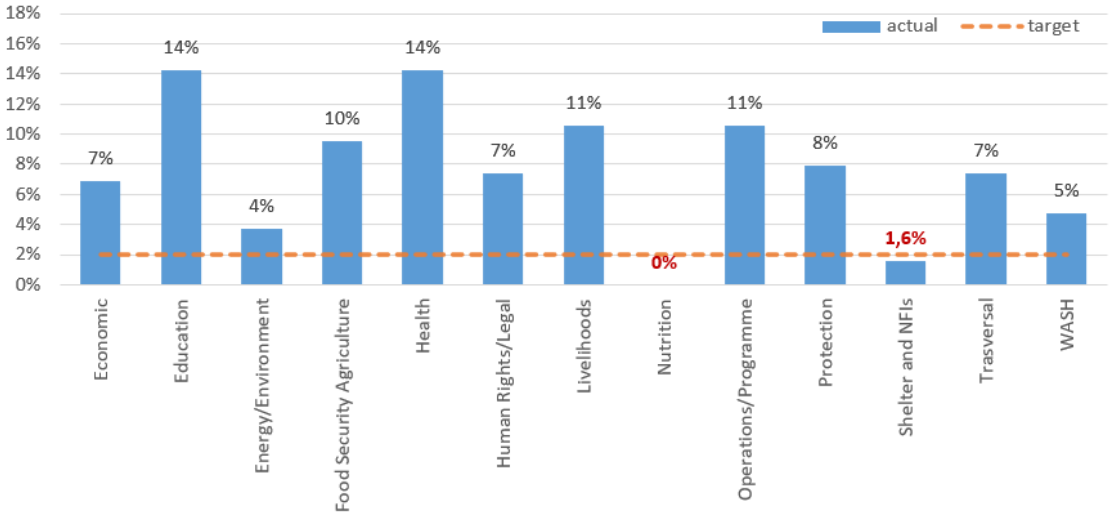
Table B.2: Results for Gaza ($APInd = 3.3$).



(a) Organization type



(b) Organization localization

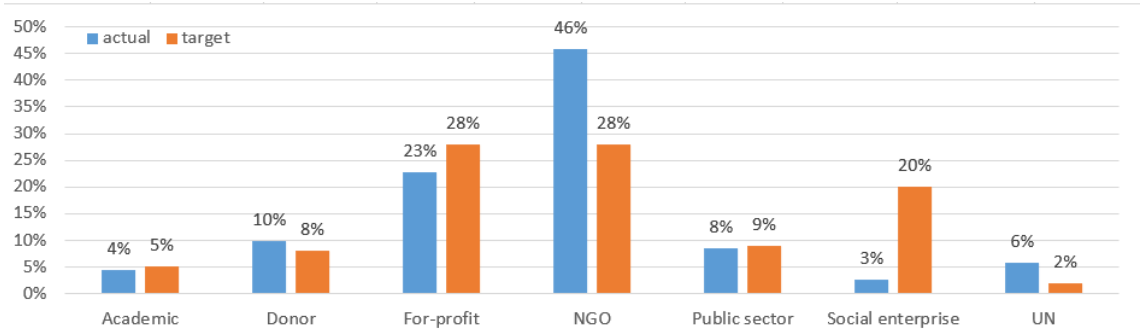


(c) Organization primary technical area

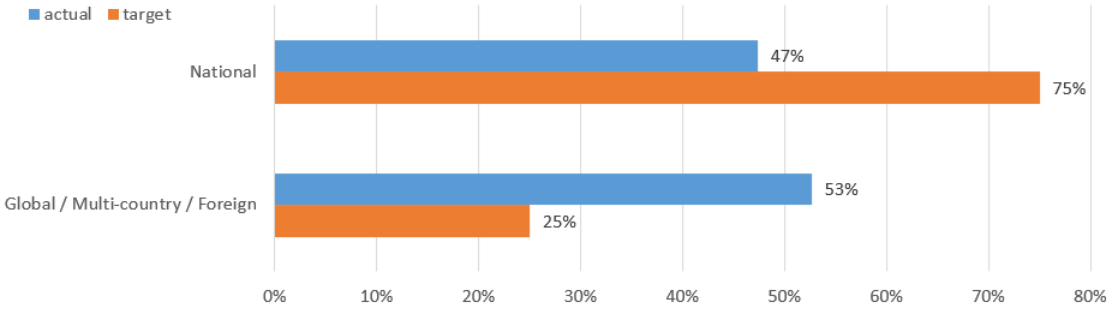
Figure B.2: The three bar graphs represent Gaza network analysis.

Jordan					
Indicator	Category	Actual (%)	Target (%)	Distance	Rating (1-5)
Organization Type	Academic	4%	5%	-0.11	5
	Donor	10%	8%	0.23	4
	For-profit	23%	28%	-0.19	5
	NGO	46%	28%	0.64	2
	Public sector	8%	9%	-0.06	5
	Social enterprise	3%	20%	-0.87	1
	UN	6%	2%	1.90	1
I_{type}					3.3
Organization Localization	Global/Multi-country/Foreign	53%	25%	1.11	1
	National	47%	75%	-0.37	4
$I_{localization}$					2.5
Organization Primary Technical Area	Economic	12%	>2%		0
	Education	12%	>2%		0
	Environment	4%	>2%		0
	Food Security Agriculture	1.5%	>2%		1
	Health	4%	>2%		0
	Human Rights	2%	>2%		0
	Livelihoods	12%	>2%		0
	Nutrition	0%	>2%		1
	Operations/ Programme	30%	>2%		0
	Protection	4%	>2%		0
	Shelter & NFIs	1.0%	>2%		1
	Transversal	16%	>2%		0
	WASH	1.5%	>2%		1
I_{them}					3.0

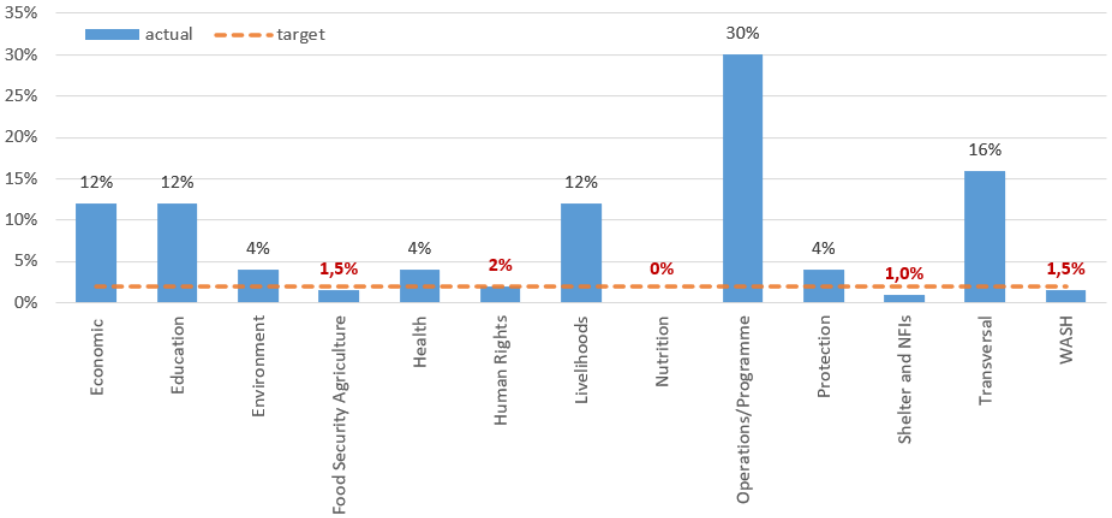
Table B.3: Results for Jordan ($APInd = 2.9$).



(a) Organization type



(b) Organization localization

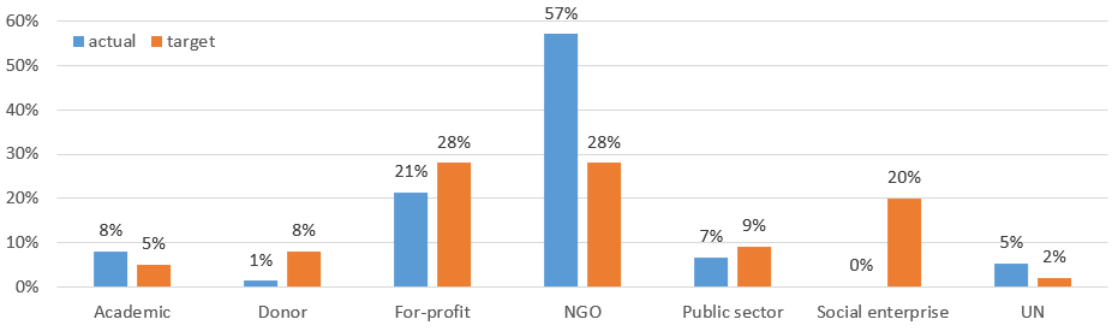


(c) Organization primary technical area

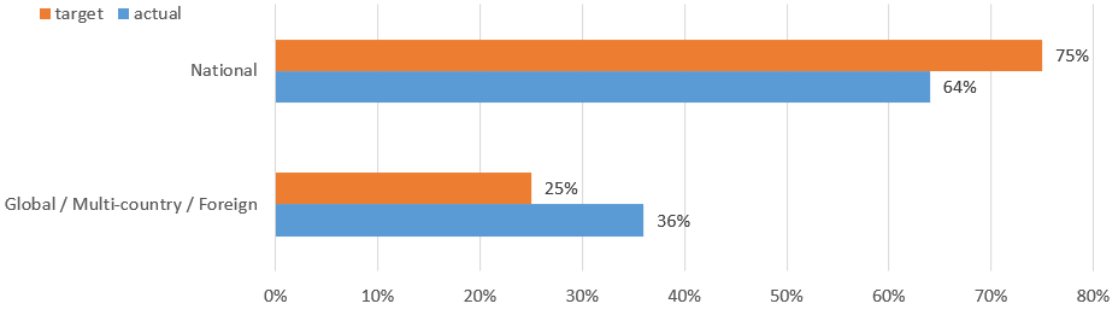
Figure B.3: The three bar graphs represent Jordan network analysis.

Yemen					
Indicator	Category	Actual (%)	Target (%)	Distance	Rating (1-5)
Organization Type	Academic	8%	5%	0.60	3
	Donor	1%	8%	-0.83	1
	For-profit	21%	28%	-0.24	4
	NGO	57%	28%	1.05	1
	Public sector	7%	9%	-0.26	4
	Social enterprise	0%	20%	-1.00	1
	UN	5%	2%	1.67	1
I_{type}					2.1
Organization Localization	Global/Multi-country/Foreign	36%	25%	0.44	3
	National	64%	75%	-0.15	5
$I_{localization}$					4.0
Organization Primary Technical Area	Economic	0%	>2%		1
	Education	11%	>2%		0
	Environment	0%	>2%		1
	Food Security Agriculture	4%	>2%		0
	Health	40%	>2%		0
	Human Rights	1%	>2%		1
	Livelihoods	1%	>2%		1
	Nutrition	0%	>2%		1
	Operations/ Programme	25%	>2%		0
	Protection	1%	>2%		1
	Shelter 0& NFIs	1.6%	>2%		1
	Transversal	13%	>2%		0
	WASH	3%	>2%		0
I_{them}					1.0

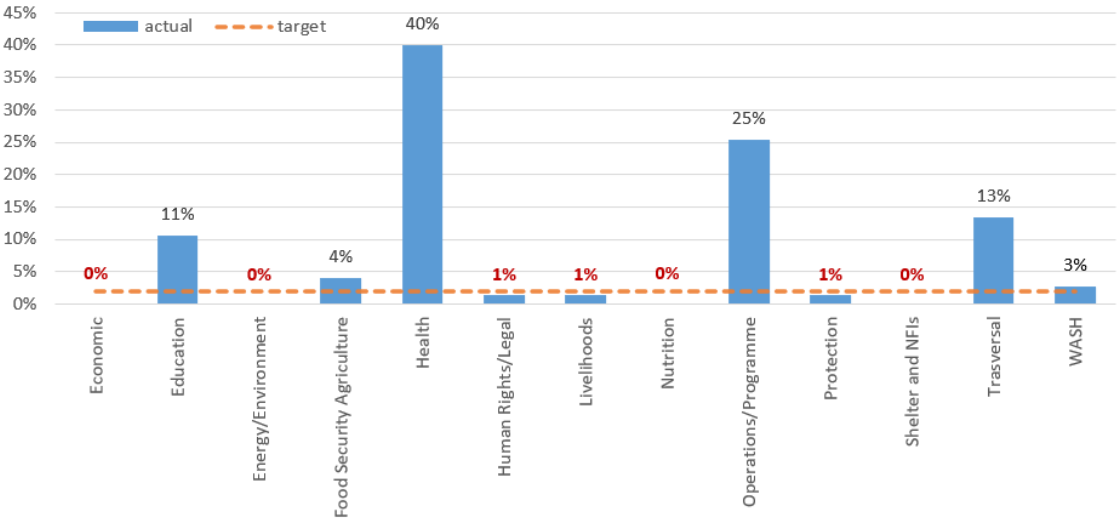
Table B.4: Results for Yemen ($APInd = 2.7$).



(a) Organization type



(b) Organization localization



(c) Organization primary technical area

Figure B.4: The three bar graphs represent Yemen network analysis.

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