Leveraging Supply Chain Management and Business Practices in Micro and Small Firms

Data Collection Guidelines – Version 5.0

`MIT GeneSys`, is a research project led by Dr. Josué C. Velázquez Martínez (http://ctl.mit.edu/about/bio/josue-c-velazquez-martinez) from the MIT Center for Transportation & Logistics, that has the purpose of contributing to the survival and growth of small business in the world, specifically in developing countries, by improving their operations and supply chain management decisions. The objective is to provide a framework of managerial insights aimed at improving productivity and competitive advantage in the small firms.

This manual is designed to serve as guidelines for data collection of supply chain processes and decisions in micro and small companies through the MIT GeneSys App. It compiles valuable information based on a business practices survey (McKenzie & Woodruff, 2016), the toolkit from Read a Plant Fast (Goodson, 2002), the Supply Chain Operations Reference (SCOR®) model version 12.0 (APICS Supply Chain Council, 2017), and previous versions of this manual.

MIT Collaborators:

Josué C. Velázquez Martínez	*Research Scientist, MIT Center for Transportation & Logistics, USA*
Cansu Tayaksi	*Postdoctoral Associate, MIT Center for Transportation & Logistics, USA*
Ximena Castañon	*Student, MIT Supply Chain Management Class of 2018*
Rosana Builes	*Alumna, MIT GCLOG Class of 2017*
Rafael Escamilla	*Alumnus, MIT GCLOG Class of 2018*

External Collaborators:

José A. Larco	*Professor, Universidad de Tecnologia e Ingenieria, Peru*
Fernando Perez Lizano	*Lecturer, Universidad de Piura, Peru*
Gianmarco Merino	*Research Assistant, Universidad de Piura, Peru*
Carolina Mendoza	*Alumna, EAFIT, Colombia*
Camilo Mora Quiñones	*Lecturer, Monterrey Tech – Santa Fe, Mexico*

Table of Contents

1. Overview

Today micro and small firms are playing an important role in the world: more than 95% of the companies in the world are micro and small firms. They account for the majority of jobs in most OECD countries, and many of them represent a substantial share of the suppliers and customers of large firms. The micro and small firms have their own specific set of strength and weaknesses compared to the large firms, and these attributes require specific measures for business growth. The practices for large firms cannot be straightforwardly translated into the context of small firms, and thus the understanding of the context requires special understanding. Due to a lack of understanding of the main challenges and opportunities, only a fraction of these small firms survives and develops into a high-growth firm.

MIT GeneSys started in 2016 with the aim of contributing to small business growth in the developing countries. The objective of the project is to provide a framework for managerial insights for micro and small firms by:

- studying the performance levels to understand the causes of inefficiencies due to the lack of managerial quality and poor supply chain management performance (e.g. inventory management, production, procurement, etc.),
- characterizing the companies under study based on common features (e.g. sector, type of product, life cycle, size, etc.) and assess the level of the development and adoption of supply chain processes and business practices,
- and building a set of Supply Chain best practices for the micro and small businesses (i.e. Supply Chain Levers) that require minimum changes in their business (i.e. easily adaptable, user-friendly, etc.) with maximum impact in the key indicators (i.e. survival rate, sales growth, and productivity).

The study aims at answering the following research questions:

1. What is the level of adoption of general business practices, supply chain practices and lean practices in small firms?

2. How much time does the decision maker spend in conducting different supply chain activities and how does he organize his time?
3. What are the factors that may influence the level of adoption of the aforementioned practices (firm size, the gender of manager, type of firm, service vs. manufacturing, educational level of general manager, years of experience of general manager, time-management habits etc.)?

MIT GeneSys project involves the engagement of 15+ universities in multiple countries working with more than 500 companies. We design a comprehensive methodology that helps analysts to better understand the specificities of small firms in terms of the business practices and managerial quality.

This document includes an overview to the GeneSys methodology (Velázquez-Martínez & Tayaksi, 2018), the proposed data collection timeline, and the details about how to collect data through different approaches as Questioning, Company Tour and RPA, Immersion and Shadowing.

> ***Note that this guideline intended to be only for the team of analysts/ consultants, and NOT by the members of the*** **company under study. This implies that the questions should NOT be directed to the manager or decision makers within the company under study, but they should be answered by analysts/ consultants based on observations.**

2. Data Collection Approach

The data collection study is designed to gather primary data through *questioning* and *observation* of the business processes and principal decision makers within a micro/small company. The data collection process is based on surveys, personal interviews and observations at the firms´ workplace. A group of analysts (usually composed by two people) "immerse" into the company to understand the day-to-day activities. This process is conducted iteratively until a proper validation of the data has been confirmed (see Figure 1).

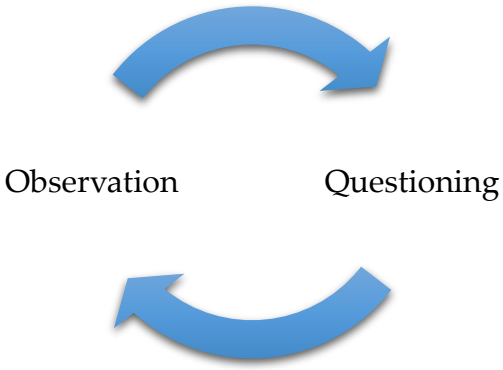

FIGURE 1: DATA COLLECTION APPROACH – THE ITERATIVE CYCLE OF QUESTIONING-OBSERVATION

The data collection approach is based on the GeneSys Methodology (Velázquez-Martínez & Tayaksi, 2018), contains 5 criteria: **Company Profile, Supply Chain Management Practices, Lean Management Practices, Business Practices and Behavioral Operations (**see Figure 2). Each criterion includes its own questions that practicing guides to better understanding survival potential and efficiency.

FIGURE 2: 5-DIMENSION MODEL OF THE GENESYS METHODOLOGY (VELÁZQUEZ-MARTÍNEZ & TAYAKSI, 2018)

The sections between 2.1 and 2.5 represent a more detailed explanation of the 5 criteria (Company Profile, Supply Chain Management Practices, Lean Management Practices, Business Practices and Behavioral Operations) of the model.

2.1. Company Profile

Company Profile survey, which aims at collecting data about company profile (years of existence, number of employees, sector of the company, level of education & gender of the decision maker, etc.) is located in the Questioning Section (see Section 3.1) in the MIT GeneSys App.

2.2. Supply Chain Management (SCM) Practices

One of the main reasons that a small firm fails to develop into a high-growth company is the lack of supply chain expertise, which points out that improvements in supply chain processes are vital for increasing the survival rate of small businesses. Due to this reason, the model (Velázquez-Martínez & Tayaksi, 2018) includes the SCM Practices (Supplier Relationship Management & Procurement, Customer Relationship Management & Delivery, Operations Management and Planning & Business Processes) to know the level of adoption of supply chain practices for small firms. Questions related to SCM practices are located in the Immersion Section (see Section 3.3) of the MIT GeneSys App.

2.3. Lean Practices

Lean principles, originally invented by Toyota Motor Company (Ohno, 1988), are business improvement philosophy and strategy aim at eliminating waste and increasing efficiency in a company. Lean is often considered as a strategy for large companies but small businesses also have the opportunity to be more competitive by increasing their efficiency level by adopting lean principles. With the help of lean criterion, we are able to assess the adaptiveness level of lean philosophies in a small company. The questions regarding this part are located in the Company Tour and RPA Section (see Section 3.2) in the MIT GeneSys App.

2.4. Business Practices

Efficient implementation of business practices contribute to improving the performance of a small business, and for this reason, one of the objectives of this project is defining the level of adoption of

general business practices. McKenzie and Woodruff (2016) study the impact of 26 business practices on the productivity and survival of small firms, by conducting surveys of companies in seven developing countries. Marketing, buying & stock control, costing & record keeping, and financial planning practices provide a basis for the survey.

26 Business-Practice questions that are derived from the business practices survey (McKenzie & Woodruff, 2016) appear in the Questioning Section (see Section 3.1) in the MIT GeneSys App.

2.5. Behavioral Operations

Behavioral Operations aims at measuring the managerial quality of the decision makers in small firms by conducting shadowing. By shadowing a decision maker, we gain a deeper understanding of their behavior pattern. The Shadowing Section (see Section 3.4) in the MIT GeneSys App is for understanding the behavior of decision-makers about the different type of activities (e.g. planned activities/ interrupted activities/ key activities) in different functional and sub-functional areas in a small business and discovering how this connects the quality of management with the development of a small firm.

3. Data Collection Process & MIT GeneSys App

Questions needed for the data collection are located in the mobile application (MIT GeneSys App), in 4 different sections: Questioning, Company Tour, Immersion, and Shadowing. In the following sections (Sections 3.1 – 3.4) the analysts can find the detailed description of each part.

3.1. Questioning

The Questioning section is composed of two different surveys: Company Profile and Business Practices. The team of analysts applies to the General Manager (i.e. main manager/director of the company that usually makes most of the decisions) the Company Profile survey composed of general questions with the aim to learn the profile of the company in detail. Then, the team conducts the Business Practices survey with the decision maker. These two surveys are located in the Questioning section of the App for the convenience of analysts.

The flow of the Questioning is as follows:

- First 79 questions are Company Profile questions.
- After question #80, analysts will see the Business Practices Questions (BP) and Validation questions (V) consecutively (if applicable) (see `**Important Notice**` below). That means that following each Business Practice Question there could be one or more validation questions for observing that the practices are really applied or not.

Example:

Q 80. Have you ever compared prices with your competitors? (BP)

The interviewee may incline to say `yes` to this question because after being asked, he/she could think it is a good idea to compare the prices with the competitors to drive a conclusion about the market price. On the contrary, the interviewee may incline to say 'no', if he/she is thinking that comparing prices with competitors is not an appropriate thing to reveal, although they do that. For sensing the truth, analysts should observe whether the firms are really applying the business practice or not with the help of the validation questions after each Business-Practice questions (if applicable).

Q 81. How frequently are you comparing your prices with your competitors? (V)

After question #80, analysts will ask one additional question about the price comparison (Validation question). If the interviewee already has said `no` in question #80 and he/she has a solid answer about the frequency he/she compares prices with the competitors, analysts may incline to think that the interviewee is applying the related business practice. The contradiction between the two answers points that he/she is holding back from exposing the truth.

Important Notice: Validation of the Business-Practice questions is vital for understanding if the decision maker is really applying these practices or not. The **(BP)** and **(V)** notations in the App informs the analysts which questions are the Business Practice Questions and which ones are the Validation Questions. When the analysts observe a question that is marked as (BP) they should know that this question is a Business Practice question. In addition, when the analysts observe a question that is marked as (V), they should not make it obvious to the interviewee that he/she is going to be validated at the moment. The analysts should continue to questioning as they were proceeding with some another regular question. At the same time, analysts should validate by combining the interviewee's

answer with their own expertise to drive a conclusion. **If there is a contradiction between the interviewee's Business Practice answers and Validation answers, analysts should not go back and correct interviewee's responses about (BP) questions (i.e. If the decision maker says that he/she is applying one business practice and you are observing through validation process that business practice is not applied (or vice versa), please do not go back to the Business Practice question for correcting the interviewee's answer.**

Figure 3 shows a sample screen for the Questioning section. The numbers that are located above the screen are specifying the question numbers and analysts can move from one question to another by tracing these numbers. Analysts can also go back and forth between the questions by clicking `previous` and `next` buttons.

There are different kind of scales that an analyst may meet during questioning. In this sample, an open answer question can be seen as `Full name of the decision-maker interviewed`. The analyst/ consultant writes the answer in the space provided below the question.

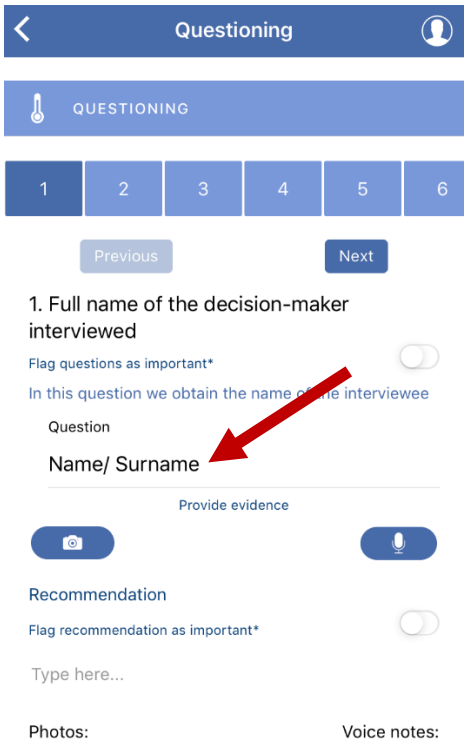

FIGURE 1: MIT GENESYS APP - QUESTIONING

In addition, there is a `provide evidence` section at the bottom of each question. By clicking the photo button, analysts can add images as evidence, or by clicking microphone button the analyst can record voices. The analyst also can enter his/her recommendation and flag the recommendation as important. If the analysts want to flag a recommendation as important, the button next to `Flag recommendation as important ` phrase should be sliced to the right. After that, analysts can write their recommendations below.

Suggested duration for the Questioning part is 4 hours. This duration may vary depending on the situation.

3.2. Company Tour and Rapid Plant Assessment

In the company tour, the main process is to map the firms´ main assets (e.g. machinery, equipment, and infrastructure) as well as a regular head-count information.

Using the toolkit based on *Read a Plant-Fast* (Goodson, 2002), the team of analysts conducts a company tour where they observe and answer the dichotomous questions of the Rapid Plant Assessment (RPA) that helps to obtain an understanding of the adoption of "lean" practices within the company operations.

Please note that there are two available versions of the RPA:

1) RPA for manufacturing firms,
2) RPA for service/commercial firms.

Both versions are available in the MIT GeneSys App, the "Manufacturing Tour" or "Service Tour" surveys will appear automatically according to the company characteristics.

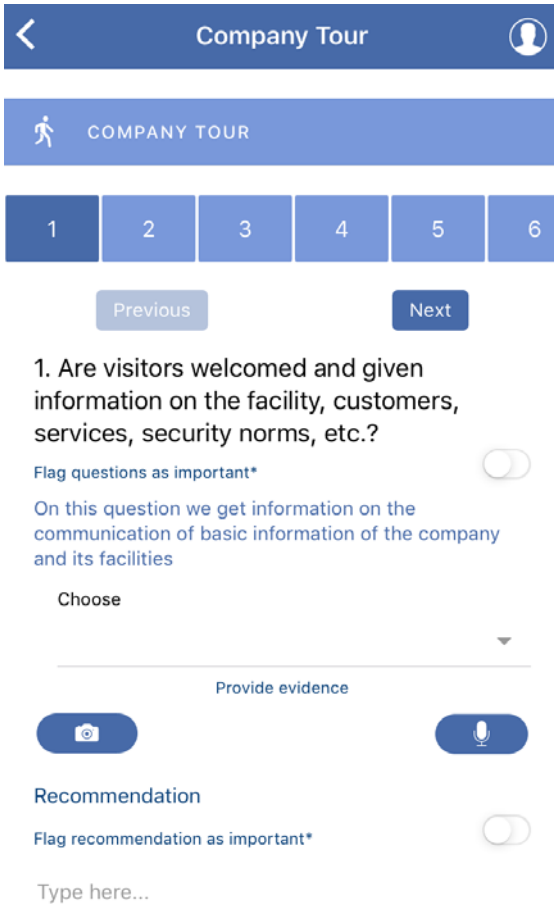

FIGURE 4: MIT GENESYS APP - COMPANY TOUR

Figure 4 shows a sample screen for the Company Tour. As it was in the Questioning section, the numbers that are located above the screen are specifying the question numbers and analysts can move from one question to another by tracing these numbers. Analysts can also go back and forth around the questions by clicking `previous` and `next` buttons.

As explained before, there are different kind of scales that an analyst may meet during the company tour. Figure 5 shows a sample screen for a multiple-choice question in the Company Tour section. After clicking the down arrow symbol, the analyst/ consultant choose the answer from the provided list.

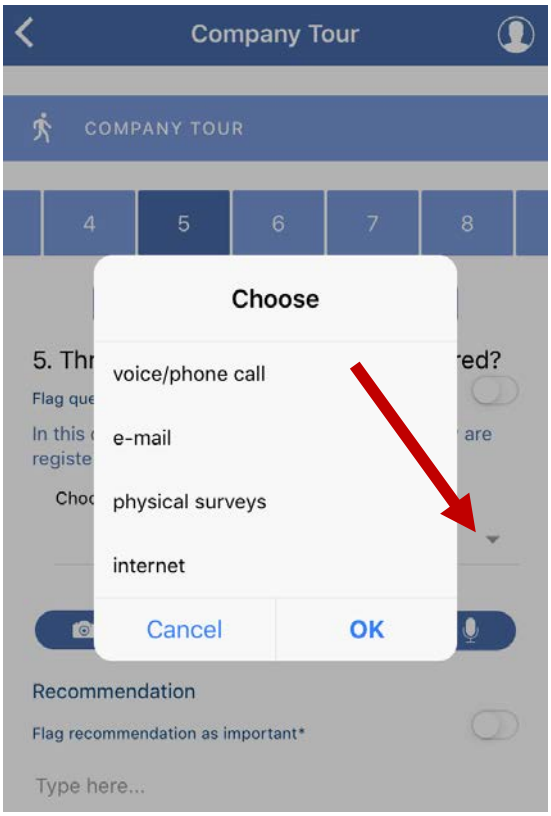

FIGURE 5: MIT GENESYS APP - COMPANY TOUR (CONT.)

Duration of the tour: Suggested duration for the company tour is 5 hours (3 + 2 in consecutive workdays). This duration may vary depending on the size of the firms (e.g. micro or small).

3.3. Immersion

Goodson (2002) defines immersion as the action of immersing bodily, but not necessarily completely, a person or a group of people, in the context of the company, with the purpose to learn about the business processes within a company by walking through the workday like any other worker. The objective of the immersion is to know the level of adoption of the supply chain management best practices for small firms by categories.

The SCM best practices for small firms that are categorized under the SCOP classification (i.e. Supplier Relationship Management & Procurement, Customer Relationship Management & Delivery, Operations Management, and Planning & Business Processes) are shown in Table 1.

TABLE 1: SCOP CATEGORIZATION

	Category	Description
S	Supplier Relationship Management (SRM) & Procurement	Include practices related to the process of working collaboratively with suppliers vital to the small firm's success and procurement needs.
C	Customer Relationship Management (CRM) & Delivery	Practices related to the process of managing a company's relations and interactions´ with clients identifying their preferences, addressing their claims with the purpose of satisfying better their needs.
O	Operations Management*	Practices related to all the operations and activities of the small firm includes the managing of the production of goods or services.
P	Planning & Business Processes	Practices related to the planning process in the operating a supply chain and the business model in general.

** The questions in this section complement the questions of the RPA tool and investigate how the operations are managed.*

We present the following instructions for the immersion process during the field study:

- Immersion is conducted ideally by two people (according to the company and the team agreement), who will serve as an external entity responsible for observing and understanding the processes, and filling out the surveys in the App.
- The team will answer whether a practice is adopted or not (and how much) based on the available evidence.
- Possible evidence that a practice is adopted may include:
    i. High level of detail in the answers provided the manager and other co-workers.
    ii. Existent observable records (e.g. manuals, reports, etc.) related to the specific practice.
    iii. The direct observation of the practice during immersion.
- The team should gather evidence of certain practices by asking the employees directly. The questions listed in the App are **NOT** intended to be asked to the manager necessarily (the questions are intended to be asked and answered by the team of the analyst).

- Some practices include a ranking scale from 1 to 4 to measure the level of adoption of that practice

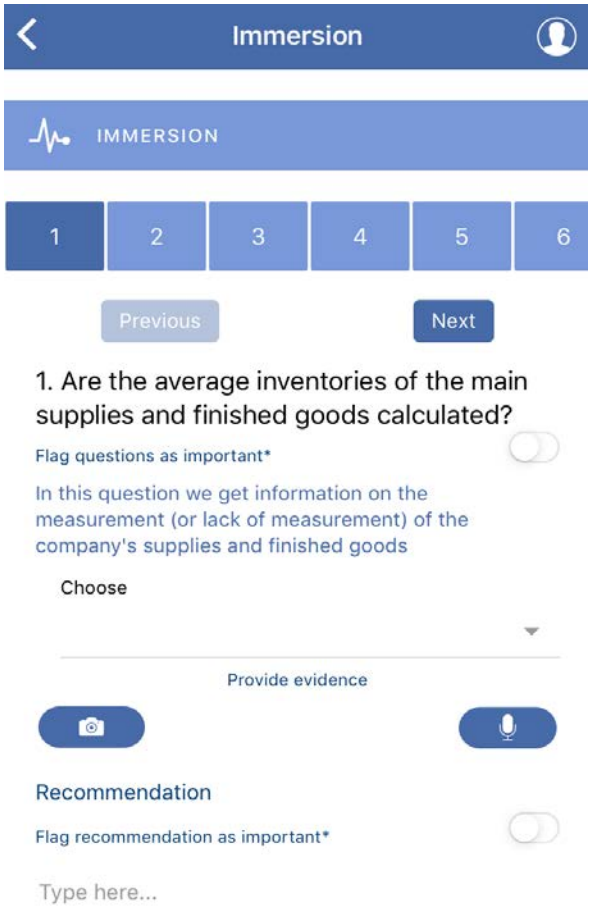

FIGURE 6: MIT GENESYS APP - IMMERSION

Figure 6 shows a sample screen for Immersion section. In addition, Figure 7 demonstrates a yes/no question as `Are the average inventories of the main supplies and finished goods calculated? `. After clicking the down arrow symbol, the analyst/ consultant chooses the answer.

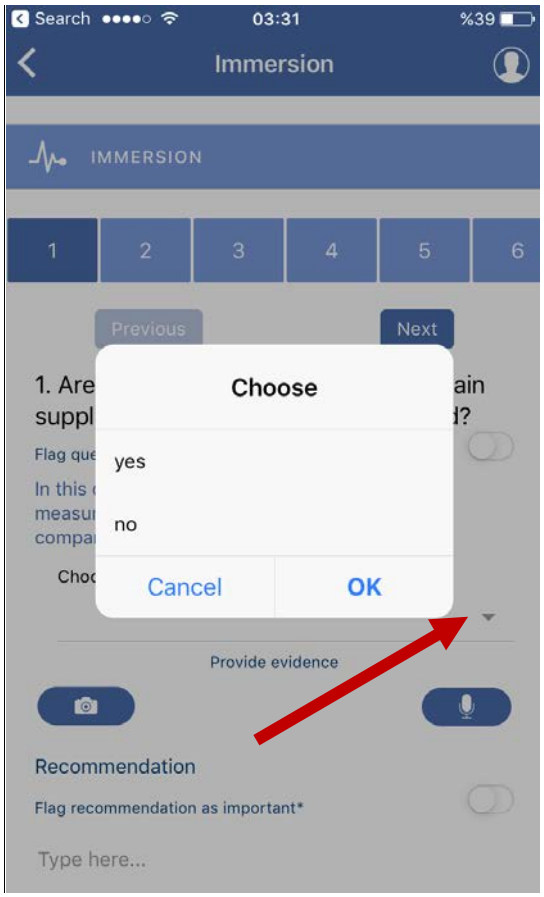

FIGURE 7: MIT GENESYS APP – IMMERSION (CONT.)

Duration of the Immersion: Suggested duration of this step is 1 -2 days depending on the size of the micro/ small Firm. As the Company Tour, it is best for the Immersion to be conducted in two consecutive days so that the analyst has the chance to reflect on the information collected and identify missing information. This will allow devising a strategy the next day to search for the missing information.

3.4. Shadowing

Shadowing implies that a team of analysts shadows a decision maker, usually the manager or owner of the company. This process will allow the analysts to learn about a task, a job or a position within a company in more detail.

The objective of the shadowing is twofold:

- Keeping a record of the activities and time spent by the decision maker.
- Determining on which activities the decision maker spends the time at the most.

The analyst/ consultant should inform the company about the following statements before shadowing takes place:

- The main aim of the shadowing is to quantify the time spent in different activities. The aim is not collecting the data about the confidential decisions and all the information overheard during the process will remain confidential if this is the request by the company.
- Analysts/ consultants will keep their interaction levels with the decision maker at the minimum for not causing any inconvenience. Only a few clarifying questions could be asked (potentially) for a better understanding of the decision-making process. Other than this, the normal activities of the decision maker will remain uninterrupted.

In addition to the declarations above, the analysts should be aware of the following:

- An activity finishes when there is a result or deliverable about. In case of activities that should be conducted for more than one day (multiple days or weeks), intermediate deliverables are enough to consider an activity as finished.

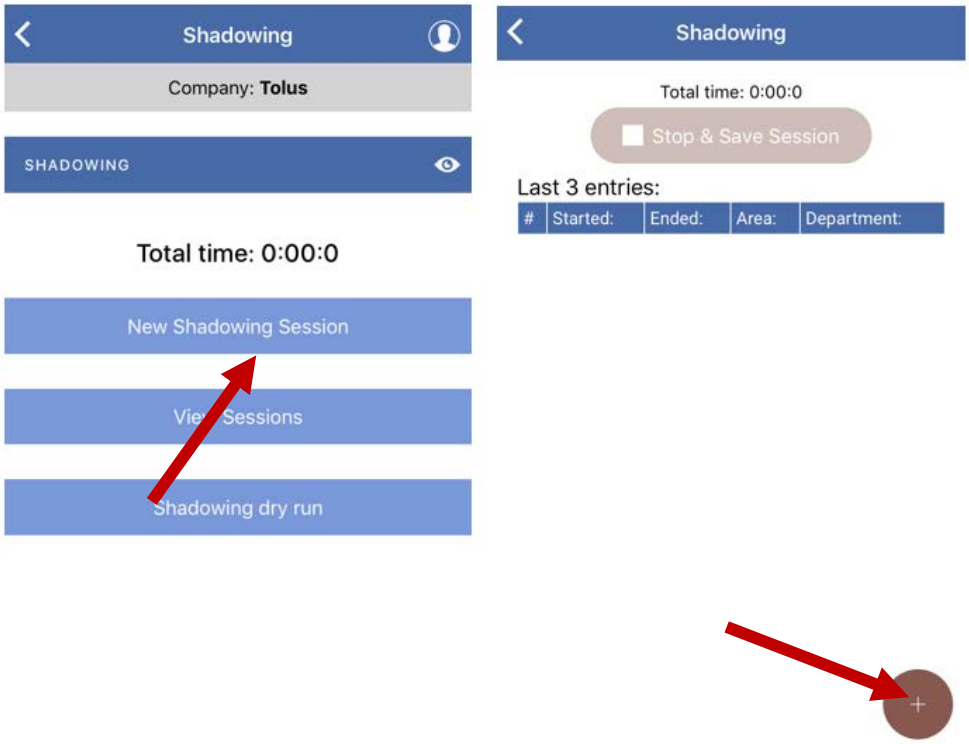

FIGURE 8: MIT GENESYS APP - SHADOWING

Figure 8 displays the opening screen for Shadowing. If the analysts want to record a new shadowing activity, he/she should press `New Shadowing Session` button. Following, the analyst should click `+` sign at the bottom-right at the screen and select the functional area that the shadowing activity is about.

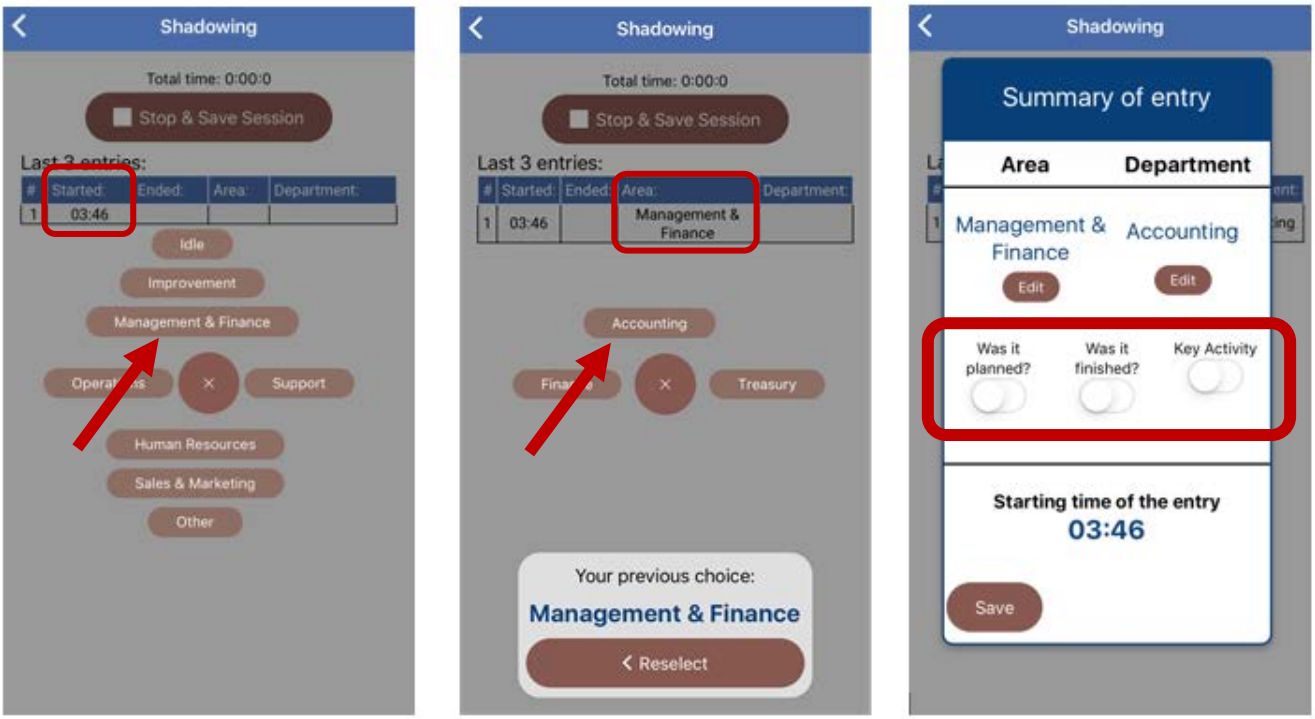

FIGURE 9: MIT GENESYS APP - SHADOWING (CONT.)

Assuming that the analyst has selected `Management & Finance` function for a shadowing activity, the App will automatically detect the timestamp that activity has started and analysts can see it in the background. If a function has sub-functions to select, App will show the sub-functions (e.g. for `Management & Finance` function, the App will suggest choosing from the following sub-sections: Treasury, Accounting, and Finance).

After selecting both the function and related sub-function (if applicable), the App will show `Summary of Entry` screen. Here, the analysts can choose whether the activity is planned or not, whether the activity is finished or not, and if this is a key activity or not. If the answer of one or more of these questions is yes, the analyst should slice the button to right. In the end, the analysts can save and finish the shadowing activity.

3.5. Qualitative Analysis

Every day (after the data collection), the team of analysts meets the manager for a brief period (5-10 minutes) with the purpose of clarifying potential misinterpretations. The objective is to

validate the information collected during the day. In addition, the team may explain to the manager the next steps (what is it going to happen in the next days) such as what is immersion or shadowing is.

4. Timeline

Table 2 introduces an example timeline for the data collection process. We suggest a 5-day process (e.g. Monday to Friday), although immersion and shadowing can be conducted for longer (or shorter) periods depending on the complexity level of the company.

TABLE 2. THE DATA COLLECTION TIMELINE

<table>
<tr><th colspan="5">Suggested Timeline for Data Collection</th></tr>
<tr><th>Monday
(1st)</th><th>Tuesday</th><th>Wednesday</th><th>Thursday</th><th>Friday
(5th)</th></tr>
<tr><td>Questioning
(4 hours)</td><td>Questioning
(2 hours)</td><td rowspan="3">Immersion
(6+ hours)</td><td rowspan="3">Shadowing
(6 hours)</td><td rowspan="3">Shadowing
(6 hours)</td></tr>
<tr><td rowspan="2">Company Tour
(3 hours)</td><td>Company Tour
(2 hours)</td></tr>
<tr><td>Immersion
(2 hours)</td></tr>
<tr><td>Qualitative Validation
(10 minutes)</td><td>Qualitative Validation
(10 minutes)</td><td>Qualitative Validation
(10 minutes)</td><td>Qualitative Validation
(10 minutes)</td><td>Qualitative Validation
(10 minutes)</td></tr>
</table>

For instance, if the analyst collects the data in a hardware store with just two employees (included the owner), the Questioning, Company Tour and Immersion could take only 2 days instead of 3 days.

For another example, if the analyst collects data in a small welding factory (with more than 10 employees), and the owner is outside the office the majority of the time and he does not allow accompaniment, analysts can reduce the duration of the shadowing to only one day.

References

APICS Supply Chain Council (2017). Supply Chain Operations Reference (SCOR) Model 12.0.

Goodson, R. E. (2002). Read a Plant - Fast. *Harvard Business Review*, 80: 105 - 113.

McKenzie, D., & Woodruff, C. (2016). Business Practices in Small Firms in Developing Countries. *Management Science*, 63(9), 2967 - 2981.

Ohno, T. (1988). *The Toyota Production System: Beyond Large Scale Production*. crc Press.

Velázquez-Martínez, J. C., Tayaksi, C. (2018). *Improving Survival of Small Firms in Developing Countries: A New Framework for Leveraging Supply Chain Management and Business Practices*. Working Paper