

CHAPTER 3

RESEARCH METHODOLOGY

In this qualitative study, we followed a two-step research process. The study is started with a broad review of the existing literatures in the research areas of the IoT adoption in the food manufacturing industry, particularly for the energy management. Then, we developed an empirical analysis using descriptive methodology.

3.1 Data Source

3.1.1 Review of Literature

As the initial step, we conducted the online search by combining few specific keywords, particularly “IoT”, “Internet of Things”, “technology”, “IoT technology”, “technological application for management accounting”, “energy management”, “energy efficiency”, “food manufacturing”, “technology and food”, “technology and dairy products”, “technology disruption and food manufacturing industry”, “dairy industry” and “managerial solutions for IoT technology”. Then, we searched for articles in Google Scholar based on these keywords. We considered searching via Google Scholar due to its large size of database as an academic search engine. Thus, we might obtain significant amount of articles. After we found the articles, we checked whether these articles issued by a Scopus (Q1-Q3) indexed journal or not. If an article is from a Scopus (Q1-Q3) indexed journal, then we take the article into our analysis. If an article is not from a Scopus indexed journal, then we do not use it as a significant contribution to our analysis. We considered Scopus indexed journals due to Scopus indexing as a highly reputed indexing for the research publications. In addition, these keywords shall appear in the papers’ title, abstract or keywords that we found. The literature review distinguished three study areas investigated in this paper, these are Internet of Things, energy efficiency, management accounting and food manufacturing industry.

We decided to search for literature in two periods. In order to reflect a certain level of technological development, the period of 2010-2020 as the first period and the period of 2003-2009 as the second period. During the first period, the technological development of the IoT technology was receiving more attention from scholars and operators compared to the period before 2010. However, we also decided to search for literatures during 2003-2009 in order to gather any earlier Management Accounting and the IoT adoption research topics that probably have relevance to the objectives of this paper.

3.1.2 Descriptive Narrative of the Case: IoT in Dairy Manufacturing Company

For the descriptive narrative of the case, we chose one of the largest Australian dairy processors. We chose this dairy processor for several reasons. First, this manufacturer can represent the Australian dairy processors who have been disrupted by IoT energy smart meters (CEFC, 2018). Australian dairy industry have experienced steep increases in energy costs as a result of retiring aging infrastructure in the domestic market in the case of electricity supply and gas consumption (Wood, et al., 2017) (CEFC, 2018). The instalment of energy smart meters on several energy hotspots, such as milk drying machines, will help the Australian dairy industry not only in maintaining its competitiveness, but also in enhancing its profitability. To grasp this opportunity, the selected Australian manufacturer has installed IoT-based energy meters on machine level in order to gather real-time energy consumption data on machine level. The examples developed at the selected Australian manufacturer have potentials to be applied across Australian dairy processors and for other dairy manufacturers in other countries. Second, this selected manufacturer has been focusing more on energy efficiency and disruptive technology application related to the IoT.

3.2 Analysis Technique

Regarding to qualitative research, Yin (2011) states that the validity of the study is the key quality control that researchers shall consider. In addition, Maxwell

(1996) outlines two practices for overcoming the threats of validity in qualitative study. These two practices consist of testing rival explanations (negative cases and contradictory evidence) and triangulation.

Accordingly, for this qualitative study, we aim to avoid the threats of validity by searching for contradictory evidence and or negative cases throughout the research process. For instance, although there will be particular assumptions of the phenomenon investigated inevitably in this study, we would continuously test our scepticism by conducting double-checking and searching more sources that probably has several remote possibilities in regards of the phenomenon investigated. Subsequently, we conducted data triangulation to avoid the threats of validity in our study. Data triangulation is conducted by investigating various information sources so that the validity of a research would increase (Guion, 2002). In the case of IoT technology on energy management for achieving cost efficiency in food manufacturing industry in our paper, we conducted the data triangulation by initially identifying the stakeholders in regards of the main focus of the topics, these are: (1) the selected Australian manufacturer and their parent company, (2) the Australian government, (3) the Australian non-governmental bodies that are recognized to deal with such matters as food manufacturing industry, dairy industry and clean energy development in food production, and (4) researchers whose articles were concerning about relevant topics in regard to the issues of IoT, energy management, cost efficiency and food manufacturing industry. Then, we would compare the information gathered from these stakeholders in order to discover areas of divergence and agreement between the groups.

Furthermore, in the secondary phase, we conducted an empirical analysis on the selected Australian manufacturer. First, we aimed to search for any evidences of the IoT adoption and sustainable performance in the (last updated) official website and the non-financial documents of the selected Australian manufacturer. In order to do so, we investigated their website using the keywords “energy efficiency”, “IoT”, “IoT smart meters”, “technology”, “smart meters”, “energy meters”, “energy management”, “energy efficiency”, “technology investments” and

“technology strategies”. Then, we collected (via Internet search) and analysed financial and non-financial official reports related to the theme of finance, governance and sustainability. We considered the financial statements for the accounting periods in the last nine years (2011-2019), since the phenomenon investigated in this study is started being adopted by the selected Australian manufacturer from 2011 until now. For the non-financial reports, we also consider the reports that are issued in the last five years (2003-2019) so that they aligned with our literature review. Subsequently, we formed a descriptive narrative. Because of analysing non-financial and financial reports as well as the official website of the company that are related to the IoT adoption, energy efficiency and sustainable performance (including the involvement of management accounting), we could gather insightful information that is value-added for our descriptive narrative.