Chapter 9   Conclusions and Future Research

In this chapter, we present the conclusions of this research. We begin by providing answers in Section 9.1 to the four research questions (see Chapter 1) that we set out to investigate at the beginning of our study. Then, we explain our answer to the problem statement in Section 9.2. Finally, we point out the research limitations and indicate areas for future research in Section 9.3.

The basic idea of the research is to support the ISGMs to survive in a globalised world. In Chapter 2 and Chapter 3, we investigated many ways and methods on how to support the ISGMs. From the findings of our investigation, we may derive the following three conclusions.

1. The ISGMs face a variety of obstacles at three levels: the local, the national, and the regional level. The obstacles lead to sixteen business challenges. From those sixteen business challenges, we successfully addressed two significant business challenges: (1) the lack of qualified information for decision making and (2) the inability to interpret the results of FSA and KPIs.

2. The ISGMs managers need support for accessing qualified information and adequate knowledge to interpret the results of FSA and KPIs. The required support may improve the quality of managerial decision making for reaching two key business targets: (1) better productivity and (2) better quality.

3. A combination of AIS and KIS can answer the question on how to support the ISGMs in accessing qualified information and adequate knowledge. Furthermore, a combination of two artificial intelligence techniques, namely a model-driven system and a rule-based technique, can be used for mimicking the logic of thinking by both financial experts and garment experts.

9.1   Answers to the Four Research Questions

In Section 1.2, our problem statement was formulated and four research questions were presented to investigate the problem statement. Subsections 9.1.1 till 9.1.4 consolidate the answers for the four RQs, based on the conclusions of the chapters 4 till 8.

9.1.1   Answer to RQ1

An appropriate use of FSA techniques may help the ISGM manager to better understand future risky decisions. By analysing carefully the origin of the financial performance problems, the manager may make a better decision. However, the complexity of the FSA techniques hinders the ISGM managers in interpreting accurately the results of FSA. This led to the formulation of our first research question.

> RQ1: *What kind of knowledge of FSA techniques does a financial expert need in order to formulate his opinion on the business performance of an ISGM?*

To answer RQ1, we made a critical review of various existing FSA techniques. We also interviewed financial experts in Indonesia. In the interview, we investigated (1) what kind of FSA techniques are needed by a financial expert, (2) how the FSA techniques can be used for an ISGM, and (3) how the financial expert interprets the results of each technique. From the findings of our investigation described in Chapter 4, we may derive the following six conclusions.

1. The DuPont model can be used (1) for exploring the origin of financial performance problems and (2) for assessing the effectiveness of the business' overall strategies (containing its operating, investing, and financing strategies).

2. The financial ratio analysis yields a more in-depth analysis of the strengths and the weaknesses of a business. The financial ratio analysis reviews the relationships among two or more accounts in the financial statements.

3. Comparative FSA is useful for tracking changes in the relative size of the various accounts. By observing the trends resulted from the analysis, seasonal sales can be investigated. Seasonal sales may lead to a significant difference in interpreting the ISGM business performance.

4. Cash-flow analysis is suitable for obtaining an expanded story about the firm's cash position, whether the firm obtains money (cash) via an appropriate way (from where does the money come).

5. Sensitivity analysis is used for providing a broader understanding of the effect of the different parameters. Based on the results of the sensitivity analysis, the quality of decision may be enhanced.

6. LIA combines the five techniques mentioned in the conclusion above in a model to analyse the ISGM business performance.

9.1.2 Answer to RQ2

We discussed in Section 5.1 the importance of monitoring the KPIs in the garment industry. The KPIs can be used for supporting an ISGM manager to develop an adequate strategy for ensuring the continuity of the production. The manager needs support in maintaining (or even improving) the level of the two business targets, namely productivity and quality. This led to the formulation of our second research question.

> **RQ2:** *What kind of knowledge of KPIs does a garment expert need in order to formulate his opinion on the business performance of an ISGM?*

To answer RQ2, a framework for KPIs was developed by analysing (1) what kind of crucial indicators are needed by an Indonesian garment expert, (2) how to use those indicators, and (3) what is the interpretation of the results of each indicator. From the findings of our investigation described in Chapter 5, we may derive the following two conclusions.

1. The most plausible causes of the lower productivity and the lower quality in the ISGMs can be grouped into six categories, namely: (1) suppliers, (2) cutting employees, (3) sewing employees, (4) partners, (5) customers, and (6) the management. We investigated the most significant root cause of the lower productivity and the lower quality and formulated sixteen KPIs.

2. An appropriate use of the sixteen KPIs may help the ISGM manager to understand further risky decisions by analysing carefully the firm's historical experience (learning from similar issues in the past). Using the information from the sixteen KPIs, the managers will be able to observe the behaviour of suppliers, employees, partners, customers, and the management in the past. With an effort to understand the human behaviour, the managers may develop an adequate strategy.

9.1.3 Answer to RQ3

We discussed in Section 6.1 why the use of LIA is suitable for the ISGMs. The ISGM owners stated to prefer to use LIA above hiring a professional expert. Constructing a combination of AIS and KIS is a challenging issue. Adequate techniques are needed for fulfilling the ISGM managers' need for the qualified information and the adequate knowledge. With this background in mind, we formulated the third research question.

> **RQ3:** *To what extent can LIA be developed for supporting the ISGM managers in accessing the qualified information and the adequate knowledge?*

To answer RQ3, we developed LIA for automated interpretation on FSA and KPIs. In this study, LIA is developed by using Microsoft Access. The goal is to test whether LIA may mimic the logic of thinking of both the financial and the garment experts. We investigated how the interpretation of the FSA and the KPIs can be organised in a conceptual model (see Section 6.2). We arrived at the following five answers.

1. The first function of LIA is recording the ISGMs business transactions according to Indonesia's accounting standards. This function fulfils the ISGM needs by providing an easy way for recording all the ISGMs transactions (by automatically following SAK-ETAP).

2. The second function of LIA is converting the accounting data into valuable information based on the FSA techniques. This can be done by following the model that resulted from RQ1.

3. The third function of LIA is providing KPIs automatically from the data recorded. This can be done by following the model that resulted from RQ2.

4. The fourth function of LIA is providing an interpretation for the results of the FSA and the KPIs. By using the historical data recorded in Module 1 of LIA and the values provided by the manager in Module 2, LIA is able to provide interpretations of the results of the FSA and the KPIs (in Modules 3 till 9).

5. For the security reasons, the *switchboard manager* in Microsoft Access enables LIA to provide users with a different authorisation based on the user or group name.

9.1.4   Answer to RQ4

Validation and evaluation are essential concepts in the development, realisation, and implementation of a model. Validation of LIA is for testing whether LIA can mimic the expert's logic of thinking. Evaluation of LIA is needed for measuring the level of LIA's performance from the user's point of view. Our fourth research question was a direct outcome of this need.

> **RQ4:** *To what extent is LIA acceptable as a tool to access the qualified information and adequate knowledge for the ISGMs?*

RQ4 has been answered by validating and evaluating LIA's performance. We presented the results of the validation in Chapter 7 and the results of the evaluation in Chapter 8. From our findings in those chapters, we arrived at the following two answers.

1. The validity of LIA's results is high. For instance, the six indicators (or evidences) provided by LIA helped the respondents in analysing the performance of INBUS 2. The six indicators are the results of a well-defined FSA and of a number of KPIs. After experiencing the six indicators from INBUS 2 by themselves, the respondents, in particular the garment experts, started to understand that the combination of various FSA and KPIs may lead them to a more comprehensive overview of the firm's performance.

2. The evaluation of LIA is positive. The positive evaluation was confirmed by (1) an acceptable level of satisfaction in using LIA, (2) a good assessment of LIA's performance, (3) an acceptable computer literacy, and (4) a good opinion on the perceived usefulness of LIA.

9.2   Answer to the Problem Statement

In this section, we provide our answer to the problem statement formulated in Chapter 1. The answer is based on the answers of the four RQs in Section 9.1. The problem statement we formulated reads as follows.

PS: *To what extent can LIA be used (1) to access qualified information, (2) to give professional guidance, (3) to provide a second opinion, and (4) to improve the learning process in interpreting the results of the FSA and the KPIs?*

With reference to the answers to the four research questions, we provide the following five answers.

1. The results of this research have shown that to a large extent, it is possible to construct a combination of AIS and KIS which ISGM managers can use for the interpretation of the results of the FSA and the KPIs. We proposed the LIA model which the ISGM managers can use for this purpose. For obtaining adequate insight into what has occurred in the ISGMs, the model combines FSA and KPIs.

2. LIA is able to provide qualified information for an ISGM. The qualified information is the result from the combination of AIS and KIS. The respondents agreed on a good validation of the result of FSA and KPIs.

3. LIA is able to guide the ISGM manager in interpreting the qualified information. By combining the results of the AIS and the KIS, LIA may be used for providing professional guidance.

4. LIA is able to provide a second opinion for both financial and garment experts. LIA supports the user as if they interact with another expert who monitors closely the production processes, delivers an early warning message, and provides interpretation on the qualified information.

5. LIA is able to provide an easier way in learning how to interpret the qualified information (to some extent). By using LIA regularly, the user will be able to learn how to analyse ISGM business. The logic of thinking of the experts stored in the KIS will be transferred to the user in a concept of learning by doing.

9.3   Limitations and Suggestions for Future Research

It is possible to build LIA for performing the task of interpreting the results of the FSA and the KPIs in garment industry. As stated above, the results of the validation and evaluation process indicate that LIA is capable and suitable to interpret the qualified information. We conjecture that in the long run ISGMs will be in compliance with the accounting standards and will harmonise the provision of accounting information in financial statements. However, we must admid that LIA has some limitations. Overcoming these limitations will be the goal of future research on LIA. This section aims at listing the limitations (Subsection 9.3.1), and the suggestions for future research (Subsection 9.3.2).

9.3.1   Research Limitations

We list seven main research limitations below.

1. The SAK-ETAP is an adequate accounting standard for SMEs in Indonesia. However, up to now, the SME in Indonesia has a freedom to choose one of two accounting standards, namely: (1) the SAK-ETAP which is only for SMEs or (2) the accounting standard for all firms. LIA is constructed only to deal with the SAK-ETAP. Changes in SAK-ETAP will affect the knowledge base of LIA. Therefore, the LIA knowledge base should be continuously updated.

2. Since LIA's techniques in FSA are rather idiosyncratic, some financial experts suggest providing more comprehensive approaches in FSA to be used by LIA. One of the ideas is to combine LIA with the credit analysis conducted by the banks.

3. The values in Module 2 of LIA are only able to accommodate the opinion of a single manager (a person). When there is more than one person who contributes collaboratively in

deciding the values in Module 2, their opinions cannot be accommodated automatically by LIA.

4. Most of the ISGMs never use a KIS. When they use a computer for supporting their daily activities, they only use a TPS. LIA attracts the ISGM managers' attention because of the advantage that they may obtain access to knowledge stored by the expert. After the ISGMs have become familiar with the concept of KIS and the use of LIA for recording and analysing the firm's financial and operational data, more comprehensive AI techniques, such as data-mining, case-based reasoning, and fuzzy rules can be used for improving LIA's capabilities.

5. We faced a limitation of the sample size when testing the impact of LIA. Our test concern (1) providing qualified information, (2) providing professional guidance, (3) providing a second opinion, and (4) further facilitating the learning process for non-domain experts and university students.

6. The construction of LIA model is based on limited resources, viz. Microsoft Access. Microsoft Access is a widely used database system. From an economic perspective, the use of Microsoft Access in generating the interpretation of the results of FSA and KPIs is affordable and most of the ISGMs will be able to afford to buy the database system. However, Microsoft Access has some limitations, for instance: (1) there is a lower scalability which means that Microsoft Access will bring a huge amount of problems when its file size exceeds the database limit (about 2 gigabytes), (2) there is a lower level of security than SQL Server or mainframe database systems have, (3) its data integrity and recovery is not as robust as on SQL Server that provides triggers and transaction logs, and (4) there is no automated process or tool for backing up the database.

7. Based on the results of the evaluation of LIA, graphical representation plays a significant role in supporting the ISGM managers to investigate and to discover a specific trend that is relevant in figuring out what happens in the daily transactions. Graphical representation may help the ISGM manager to pinpoint the critical issues in a short period of time (in particular for a time-series analysis). LIA however lacks a graphical representation.

9.3.2 Future Research

In view of the limitations of the research and the choices that always must be made in doing research, many strands for future research can be identified. Below, we discuss eight potentially fruitful research areas.

1. A comprehensive approach where the user may choose SAK-ETAP or another accounting standard in the first stage of installation will improve the practicality of LIA. Whatever the standard chosen, an update function of the accounting standard should be developed.

2. A more comprehensive approach in FSA can be realised by providing more specific analyses in the system. At least there are three kinds of analyses that may improve LIA, namely: (1) credit analysis for evaluating the firm's possibility of obtaining a certain amount of loans from the bank, (2) accounts receivable analysis for identifying effective debt collection, and (3) cost variance analysis for comparing the existing costs with the standard costs.

3. For accommodating the opinions from more than one decision maker, LIA should be equipped with a structured technique for organising and analysing complex decisions. One of the possible techniques is the Analytic Hierarchy Process.

4. After realising the benefit from LIA, more ISGM managers may follow the accounting standard and develop more trust in LIA. We conjecture that in the long run ISGMs will be in compliance with the accounting standards and are willing to share the financial and operational data. With more data, we may compose a data-mining model adequate for any

ISGM's needs. Then, LIA capabilities may be improved by combining the existing AI techniques with the new technique. When this is possible, in-depth research on ISGMs can also be conducted. For instance, when we use a data-mining method in LIA, LIA will be equipped with a capability to forecast (to predict) more accurately an event in the future by using several predetermined indicators.

5. In the future, in a controlled environment (with and without LIA) the impact of LIA could be tested in the following three areas: (1) training and educating of novices, (2) the time required to interpret a large quantity of FSA techniques and KPIs, and (3) the ease of the use of LIA in the learning process.

6. A combination of the use of a powerful database system such as the SQL Server and a programming language such as Visual Basic may minimise the weaknesses of the first version of LIA. The issues on scalability, security, data integrity, and back up can be enhanced by using a combination of the four issues to be addressed. One of the drawbacks for using this combination of database system and programming language is that the price of the system itself will increase drastically.

7. Some respondents have requested that LIA should provide a graphical representation, and not only a textual interpretation of the results of the FSA and the KPIs. In a future improvement, LIA should provide a raphical representation for the ISGM managers, in particular for the comparative FSA.

8. A further research line lies in using the combination of artificial intelligence (for analysing financial statements and other accounting reports) with accounting. It should be conducted for supporting contemporary developments in accounting (e.g, XBRL, continuous reporting, continuous auditing, and automated compliance verification).

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