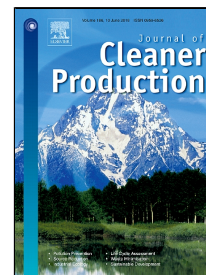


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Development of a Framework for Sustainable Enterprise Resource Planning Systems Implementation



Abdoulmohammad Gholamzadeh Chofreh, Feybi Ariani Goni, Jiří Jaromír Klemeš

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Development of a Framework for Sustainable Enterprise Resource

Planning Systems Implementation

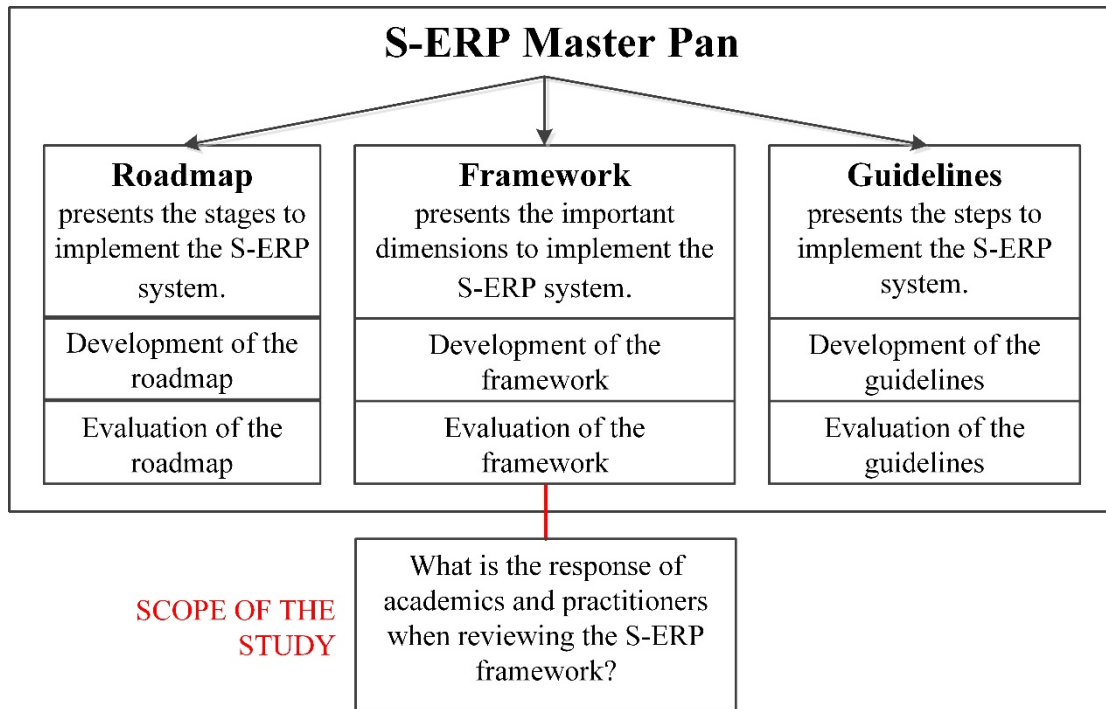
Abdoulmohammad Gholamzadeh Chofreh^a, Feybi Ariani Goni^b, Jiří Jaromír Klemeš^a

^aSustainable Process Integration Laboratory – SPIL, NETME Centre, Faculty of Mechanical Engineering, Brno University of Technology - VUT Brno, Technická 2896/2, 616 69 Brno, Czech Republic

^bFaculty of Information Science and Technology, Universiti Kebangsaan Malaysia, Bangi, Malaysia

Abstract: Implementation of effective sustainability within organisations requires an integrated information system, such as Enterprise Resource Planning (S-ERP) systems. The S-ERP system helps organisations to integrate all sustainability activities into the main database within an organisation. To implement this system, practitioners need a master plan consisting of a roadmap, framework, and guidelines. Previous studies have examined the important concept of the S-ERP system, the development and evaluation of S-ERP roadmap, and the development of the S-ERP framework. This study proposes an evaluation of the S-ERP framework using expert review methods. Twelve experts are involved in the interview to evaluate the content and usefulness of the framework. The results of the analysis show that the initial S-ERP framework should be divided into two parts: sustainability implementation framework and system implementation framework. The sustainability implementation framework includes two aspects: sustainability paradigm (environment, economy, society) and decisional paradigm (strategic level, tactical level, and operational level). The operational level comprising the value chain components of an organisation. The system implementation framework consists of two aspects: strategic and implementation levels. Experts affirm that the S-ERP framework can be used by organisations from various industries.

Keywords: Sustainable enterprise resource planning; implementation; master plan; framework; evaluation.

Graphical Abstract:**Research Highlights:**

- The development of the S-ERP framework is studied.
- The evaluation procedure of the S-ERP framework is underscored.
- Peer review methods are applied to evaluate the S-ERP framework.
- The framework consists of sustainability implementation and system implementation.
- The framework can be generally used to implement the S-ERP systems.

1. Introduction

Sustainability concept has been formally embraced into business since 1987 through the Brundtland Commission reports (Goni et al., 2015). This notion aims to preserve economic and social advancement while protecting the long-term value of the environment (Gauthier and Wooldridge, 2018). Morioka et al. (2017) stated that the organisations are gradually embedding the sustainability concept into their corporate to endure the competitive advantage. They

integrate all sustainability aspects consisting environment, economic, and social into their business processes for adding their business value (Goni et al., 2017).

During the implementation of sustainability, organisations face the problem of data and information separation (Chofreh et al., 2014a). Shen (2018) mentioned that they have difficulty tracking their sustainability performance as data and information are not readily available. As a result, decision making becomes inaccurate and redundant. This problem will hinder the achievement of sustainability goals within an organisation (Ahmed and Sundaram, 2012). There is a need to align information system strategy with the sustainability strategy to achieve effective sustainability implementation.

Chofreh et al. (2014a) had proposed the Enterprise Sustainable Resource Planning (S-ERP) system to support organisations in addressing segregation issues. This system is a new idea of enterprise systems that help organisations to integrate all entities into their value chains. For implementing the S-ERP systems, practitioners need a master plan that delivers a comprehensive plan of action.

Chofreh et al. (2016a) recommended a master plan that presents a holistic plan to implement the S-ERP system. This system embraces three interlocking features including a roadmap, framework, and guidelines. The S-ERP roadmap had been developed by Chofreh et al. (2017a) in their second part of the study and evaluated by Chofreh et al. (2017b) in their third part of the study. The roadmap shows process group to complete the S-ERP systems implementation. The results revealed that the S-ERP implementation roadmap consists of two parts: sustainable enterprise roadmap and sustainably integrated enterprise roadmap. Each of roadmaps includes several phases consisting pre-implementation (initiating, planning, and monitoring/controlling), implementation (planning, executing, closing/transition, and monitoring/controlling), and post-implementation (plan, do, check, and act).

The S-ERP framework was developed by Chofreh et al. (2017c) in their fourth part of the study. The framework shows important aspects to consider in implementing the S-ERP systems. The framework comprises of two main aspects including sustainability paradigm (environment, economic, and social) and decisional paradigm (strategy, tactic, and operation). The present study contributes to the evaluation of the S-ERP framework using expert review. Twelve experts from the related field involved in the evaluation process. The collected data is then qualitatively analysed using ATLAS.ti 6 analysis software. The analysis results indicate that the framework requires being divided into two parts: sustainability implementation framework and S-ERP deployment framework. Further explanation of the S-ERP framework is provided in Section 5. Figure 1 illustrates the general idea of the S-ERP master plan.

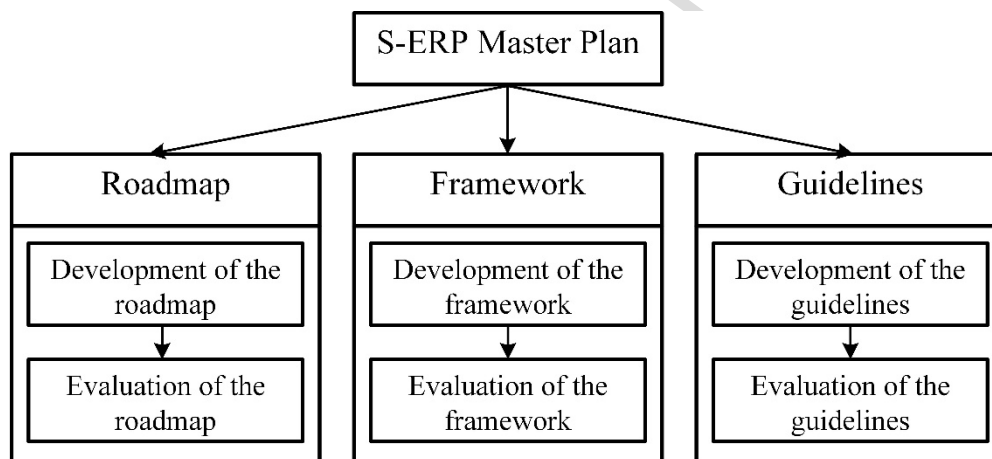


Figure 1. Components of the S-ERP systems implementation master plan (Chofreh et al., 2016a)

The novelty of this study is the S-ERP framework that provides a holistic perspective for implementing the S-ERP systems. It can be considered as a general technique that can be used by various types of organisation. The remainder of this paper is managed as follows: Section 2 provides a review of the development of the S-ERP framework. Section 3 describes the methodology used to evaluate the preliminary framework. Section 4 explains the evaluation

procedure of the framework. Section 5 presents the results and discussion. Section 6 provides the conclusions of the study.

2. Review of the Framework Development

The S-ERP framework was developed by Chofreh et al. (2017a) using a conceptual research method. Meredith (1993) discussed that this method is the root of a theory development study commonly used to construct a conceptual framework. The application of conceptual research methods depends on literature reviews. Chofreh et al. (2016b) claimed that the research on the S-ERP system is still in the early stages. There is a lack of a framework that shows numerous significant aspects in implementing the S-ERP systems.

Chofreh and Goni (2017) reviewed the related literature on sustainability implementation frameworks and Enterprise Resource Planning (ERP) systems implementation frameworks to reveal the research gap. The literature review showed that the decisional paradigm and project management concepts were commonly adopted to design the framework. However, the previous studies did not fully include all aspects of these concepts. The S-ERP framework design integrated all these concepts to gain a holistic view of the S-ERP systems implementation. Table 1 provides a summary of studies on the framework of sustainability and ERP system implementation.

Table 1. Summary of studies on the framework of sustainability and ERP system implementation

Reference	Research field		Concept used
	Sustainability implementation frameworks	ERP implementation frameworks	
Al-Mashari et al. (2003)		√	Decisional paradigm and project management.

BSI (2003)	√		Sustainability paradigm, decisional paradigm, and project management.
Bajwa et al. (2004)		√	Decisional paradigm and project management.
Yusuf et al. (2004)		√	Decisional paradigm and project management.
Zhang et al. (2005)		√	Decisional paradigm.
Basoglu et al. (2007)		√	Decisional paradigm and project management
Burke and Gaughran (2007)	√		Sustainability paradigm, decisional paradigm, and project management.
Pellerin and Hadaya (2008)		√	Decisional paradigm and project management
Loorbach et al. (2009)	√		Sustainability paradigm and decisional paradigm.
Sahran et al. (2010)		√	Decisional paradigm and project management.
Ahmed and Sundaram (2012)	√		Sustainability paradigm, decisional paradigm, and project management.
Hahn et al. (2015)	√		Sustainability paradigm and decisional paradigm.
Laurenti et al. (2016)	√		Sustainability paradigm and decisional paradigm.
Jayawickrama et al. (2016)		√	Decisional paradigm.

Panagiotakopoulos et al. (2016)	√		Sustainability paradigm and decisional paradigm.
Jagoda and Samaranyake (2017)		√	Decisional paradigm and project management.
Sroufe (2017)	√		Sustainability paradigm and decisional paradigm.
Blanco-Portela et al. (2017)	√		Sustainability paradigm and decisional paradigm.
Nawaz and Koç (2018)	√		Sustainability paradigm, decisional paradigm, and project management.
Adams et al. (2018)	√		Sustainability paradigm and decisional paradigm.

The design process of the S-ERP framework consists of two main phases: review the pertinent literature and design the structure of the framework. There are several activities in reviewing the previous studies including gather the aspects and methods used in the previous studies, analyse the concept used in the previous studies, determine the concept used in the S-ERP framework, classify the aspects according to the determined concept, and reveal the knowledge gaps in the literature.

The main structure of the S-ERP framework consists of two main aspects including sustainability paradigm and decisional paradigm. The sustainability paradigm comprises of three sustainability components comprising environment, economy, and society. This component is an important dimension for the S-ERP system as it is applied to support sustainability practices. Elkington (2014) mentioned that environmental component is related to environmental practices, the economic component is related to business profits, and society component is related to fair and

favourable labour and community. The decisional paradigm comprises of strategic, tactical, and operational levels of an organisation. This paradigm needs to be envisaged in the S-ERP systems implementation as it requires involvement from all management levels in an organisation.

The preliminary S-ERP framework considered various concepts including strategic management and project management. Bryson (2018) stated that the strategic management concept is related to the process that should perform by top managers to identify the goals, objectives, and plans of an organisation in implementing a system. The activities of the strategic management process are included in the strategic aspect of the framework.

Project management concept is associated with the process that should be accomplished by project a manager to manage a variety of project (PMI, 2017). Chofreh et al. (2016c) argued that this concept is generally applied by organisations for managing various types of project. This concept was applied as the components of the operational aspect of the S-ERP framework. Figure 2 provides the structure of the S-ERP framework.

- Preparing the enterprise profile (Barney and Hesterly, 2009)
- Identify the external environment (Barney and Hesterly, 2009 and Hitt et al., 2012)
- Identify the internal environment (Hitt et al., 2012)
- Forecast the future environment (Hitt et al., 2012)
- PESTLE, stakeholders, and SWOT analysis (Hitt et al., 2012)
- Vision and mission development (Hitt et al., 2012)
- Formulation of appropriate strategies by TOWS Matrix (Hitt et al., 2012)

- Select the appropriate strategies (Goldman and Nieuwenhuizen, 2006)
 - Integrated strategies
 - Intensive strategies
 - Diversification strategies
 - Defensive strategies
 - Generic strategies of Porter
- Alignment of strategies with Sustainability Balanced Scorecard (SBSC) (Figge et al., 2002)
 - Integration of performance measures
- Getting execution right
- Review and evaluate the performance (Hitt et al., 2012)
- Close the strategic level phase

- Project integration management
- Project scope management
- Project time management
- Project cost management
- Project quality management
- Project human resource management
- Project communications management
- Project risk management
- Project procurement management
- Project stakeholders management (PMI, 2013)

Operational Level

- Social**
- Culture
 - Accessibility
 - Participation
 - Security
 - Public utility
 - Social integration
 - Responsibility (Fernández-Sánchez and Rodríguez-López, 2010)

Environmental

- Soil
- Water
- Atmosphere
- Biodiversity
- Resources
- Energy
- Landscape
- Waste
- Risks (Fernández-Sánchez and Rodríguez-López, 2010)

Economic

- Costs
- Technical requirements
- Bureaucracy
- Social economy
- Heritage (Fernández-Sánchez and Rodríguez-López, 2010)

Strategic Level

Tactical Level

- Management/organisation
 - Commitment
 - Education
 - Involvement
 - Project team selection
 - Training
 - Roles and responsibility
- Process
 - Alignment
 - Documentation
 - Integration
 - Process redesign
- Technology
 - Hardware

- Software
- System management
- Interface
- Data
 - Master files
 - Transactional files
 - Data structure
 - Maintenance and integrity
- People
 - Education
 - Training
 - Skills development
 - Knowledge development (Sun et al., 2005)

Figure 2. The preliminary S-ERP framework

3. Research Methodology

The S-ERP framework is evaluated using the peer review method. This involves a number of experts, who have the similar expertise to the topic being observed. Tavakoli (2012) argued that this method is pertinent to improve the reliability of research results by involving a number of qualified experts from related fields. It can be done through interviews, informal discussions, or emails. Through this process, support and advice from experts on research procedures and findings are required. The collected data is then qualitatively analysed with the help of ATLAS.ti 6 software, which facilitates the process of data analysis through visualisation. Figure 3 summarises the evaluation procedure of the framework.

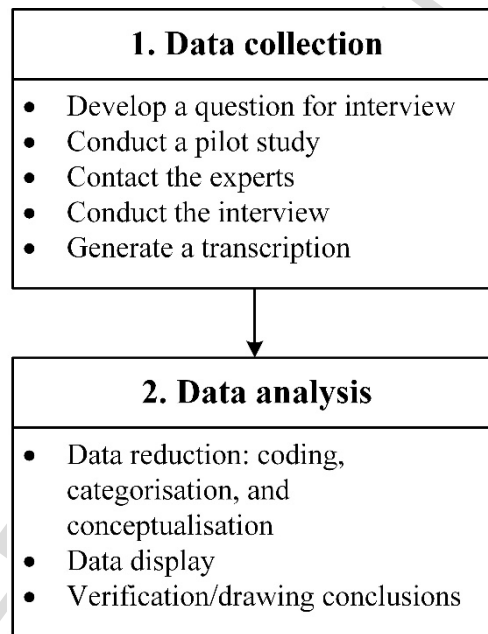


Figure 3. The process of the S-ERP framework evaluation

3.1 Data Collection

The present study applies judgement sampling for collecting the data. Sekaran and Bougie (2010) mentioned that it is a sample selection technique that relies on expert knowledge and experience on the topic under investigation. The experts involved in this study are selected based on their knowledge and experience in the implementation of sustainability, ERP systems, or S-ERP

systems. This study adopted the criteria of expert's selection from the work of William et al. (2001). They stated that the experts should have the following criteria:

1. A number of academic publications in sustainability, ERP, and ERP systems for at least five years; or
2. Teaching experience in the related field of study; or
3. Engage in a number of sustainability, ERP, or S-ERP implementation projects.

An online semi-structured interview is applied for collecting the data. Twelve experts including academics and practitioners in the field of sustainability and ERP are involved in the interview. In qualitative research, sample size ranges from 4 to 87 samples depending on data saturation. The current study gets 12 samples because there is no newer data and information until that amount of experts. This means that the data has been saturated in the twelfth expert. Conversations are recorded and transcribed for analysis purposes.

3.2 Data Analysis

The present study uses qualitative data analysis that involves a range of process to transfer the raw data that have been collected from opinion, explanation, idea, and interpretation from a number of experts into a new theory. Miles et al. (2014) stated that the qualitative data analysis process encompasses three activities: data reduction, data display, and verification/drawing conclusions. Figure 4 provides a general overview of the process flow of the qualitative data analysis.

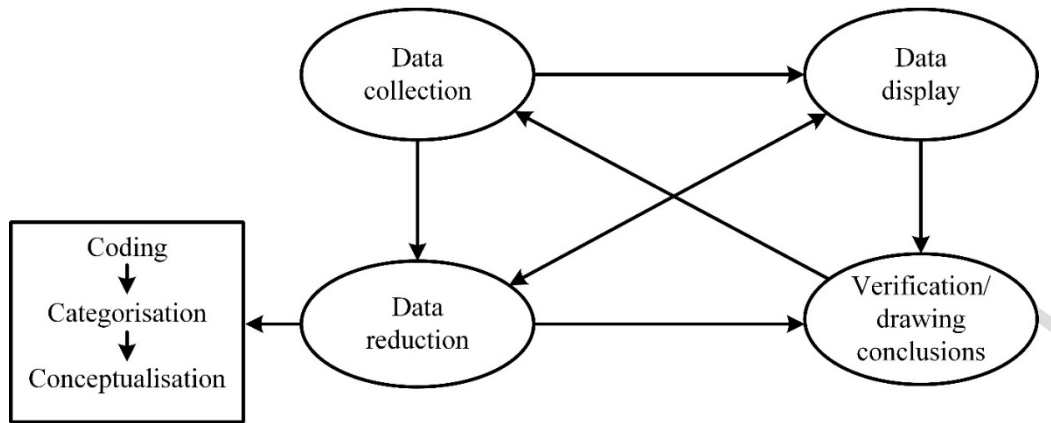


Figure 4. The process flow of the qualitative data analysis

Miles et al. (2014) defined data reduction as the process of transforming transcription from an interview into a simplified form. The general idea is to reduce innumerable amounts of data down to significant parts. This process consists of three stages including encoding, categorisation, and conceptualisation. Data display refers to the process of data visualisation to present summary and conclusions in graphical form. Verification/drawing conclusions refers to a procedure for determining the meaning of the data being analysed and verifying it.

4. Evaluation of the S-ERP Framework

The evaluation procedure of the S-ERP framework is alienated into two phases comprising data collection and data analysis. Further explanation of the evaluation process is provided in the subsequent sub-sections.

4.1 Data Collection

Data collection is qualitatively conducted using the semi-structured interview. The questions of the interview are initially developed by planning a number of key questions formulated in accordance with the initial construction of the initial framework. They include two parts: Part A for general questions and Part B is questions regarding the S-ERP framework. In Part A, the questions are for asking the experts' opinion about the general view of the initial S-ERP

framework. In Part B, the questions are more detailed about the contents of the framework and the relationships between components. The question is open so that experts can easily find and give their ideas about important things missing within the framework. This question is then evaluated by 3 experts to improve its quality.

To conduct the interview, 92 experts were invited via email, 16 experts accepted the invitation, and 12 of them provided feedback. The number of academics invited for interviews is less than the number of practitioners as the academics, who works in S-ERP area are still rare. The twelve experts that involved in the interviews including two academics and ten practitioners from Systems, Applications and Products in Data Processing (SAP), International Business Machines Corporation (IBM), and Non-Governmental Organisation (NGO), who are also active in teaching and training. Interviews are recorded, and data transcribed into text. This transcription needs to be further analysed to get an accurate meaning.

4.2 Data Analysis

Data analysis begins with data reduction, which consists of coding, categorisation, and conceptualisation. Sekaran and Bougie (2010) described coding as a method of indexing the text in transcription to develop a thematic idea model. The codes are manually generated and then inserted into qualitative data analysis software to produce their relationships. Figure 5 shows the generated codes. The codes are then converted into a network view, which is given in Figure 6.

- | |
|-------------------------------|
| 1. Master Plan |
| 1.1 Roadmap |
| 1.2 Framework |
| 1.2.1 Decisional Paradigm |
| 1.2.1.1 Strategic Level |
| 1.2.1.2 Tactical Level |
| 1.2.1.3 Operational Level |
| 1.2.2 Sustainability Paradigm |
| 1.2.2.1 Society |
| 1.2.2.2 Environment |
| 1.2.2.3 Economy |
| 1.3 Guidelines |

Figure 5. Generated codes

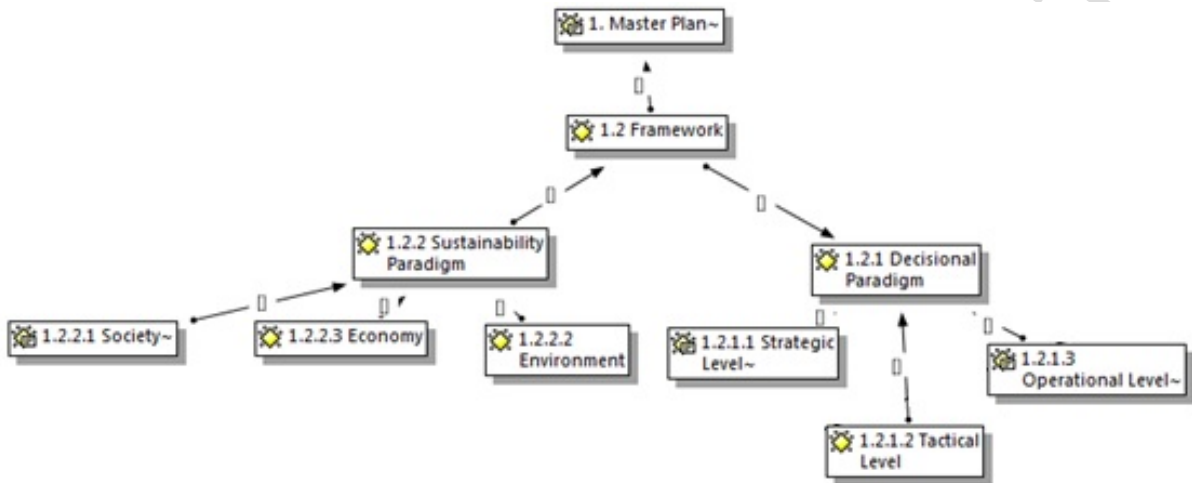


Figure 6. Network view of codes

The analytical procedure is then continued by categorising the text according to the code. This process is an early stage for abstract and constructs theory. The generated code should be manually given into appropriate citations in the transcription of the interview. The Atlas.ti software facilitates the user to visualise the categorisation process. Figure 7 illustrates the categorisation example.

Interviewer:	OK. Thank you.
Respondent:	OK. So if we go to your question number 4. Do you think strategic, tactical, and operation levels are the components that should be considered? Yes, definitely. And they have to be integrated. I think the core competence of the successful strategy is that you
0190	
0191	
	1.2 Framework

Figure 7. Sample of categorisation

The last activity in data reduction is conceptualisation, which is the process of transforming the categories into concepts. This activity has three main steps containing an initial memo, sorting and analysing scrap beginnings, and memo memos. Writing the initial memo is the procedure of giving an explanation for the code. An example of an initial memo is shown in Figure 8.

1.2 Framework

Respondent Number	Comment	Summary of Comment
2	<i>"I like your framework. Of strategic, tactical, and operational level as the classical level of running of the company. And your sustainability framework which is bottom line or ESG or whatever you want to call it. I like it and it needs to be combined."</i>	Supportive comment
	<i>"I also like the components of your figure 4. The paradigm. So figure 4 what you called it S-ERP framework. I like that."</i>	Supportive comment
	<i>"Do you think the decisional paradigm, sustainability paradigm should consider in this sustainability ERP implementation? Yes. They must go as I said in the very beginning. This is very relevant. So it is a must."</i>	Supportive comment

Figure 8. A sample of the initial memos

Sorting memos is a process for categorising memos according to their code and analysing them logically. This activity allows researchers to understand main subjects and important variables in the study. The memos need to be arranged according to the proper code. Similar memos in the same category should be combined to evade data redundancy. Figure 9 gives an example of sorting memos.

1.2	Framework			
(21)	Change the title of initial S-ERP framework into initial S-ERP implementation framework	X		The title has been changed in the final framework
(22)	Should consider the difference between operation and project	X		<ul style="list-style-type: none"> ▪ Based on PMBOK, the project, portfolio, and operation have different definition; however, this approach was not considered in designing the initial master plan ▪ The design of final master plan considers this approach
(23)	The decisional paradigm (strategic, tactical, operational) is more of organization process or for routine activities	X		<ul style="list-style-type: none"> ▪ Based on PMBOK, the project, portfolio, and operation have different definition; however, this approach was not considered

Figure 9. A sample of sorting memos

Integrating memos is the process of incorporating related memos to expose connections between categories. An example of integrating memos is shown in Figure 10.

Memo	Applied	Not Applied	1 Master Plan	1.1 Roadmap	1.2 Framework	1.3 Guidelines	General Comments
1.2 Framework							
(21) Change the title of initial S-ERP framework into initial S-ERP implementation framework	X				1.2-21		
(22) Should consider the difference between operation and project	X			1.1-22	1.2-22	1.3-22	
(23) The decisional paradigm (strategic, tactical, operational) is more of organization process or for routine activities	X				1.2-23		
(24) It is better to have two		X					

Figure 10. Sample of integrating memos

The next step in data analysis is the data display. This process enables the identification of systematic patterns and interrelationships for further analysis. The integrated codes, which show the application of expert's comments, are placed in the framework. A sample of data display is illustrated in Figure 11.

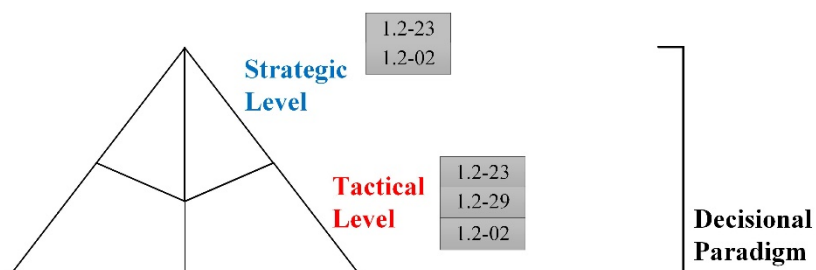


Figure 11. A sample of data display

Image and verification conclusions provide the conclusions of data analysis by giving meaning to the data and verifying it. This process leads to the emergence of new concepts and theories in a study. Miles et al. (2014) mentioned that the conclusion drawing and verification process are performed by noting patterns, explanations, casual flows, and prepositions. Following up technique is used to confirm, check, and verify the conclusions. The results are re-sent to the experts to affirm the research findings. Figures 12 and 13 provide the final S-ERP framework.

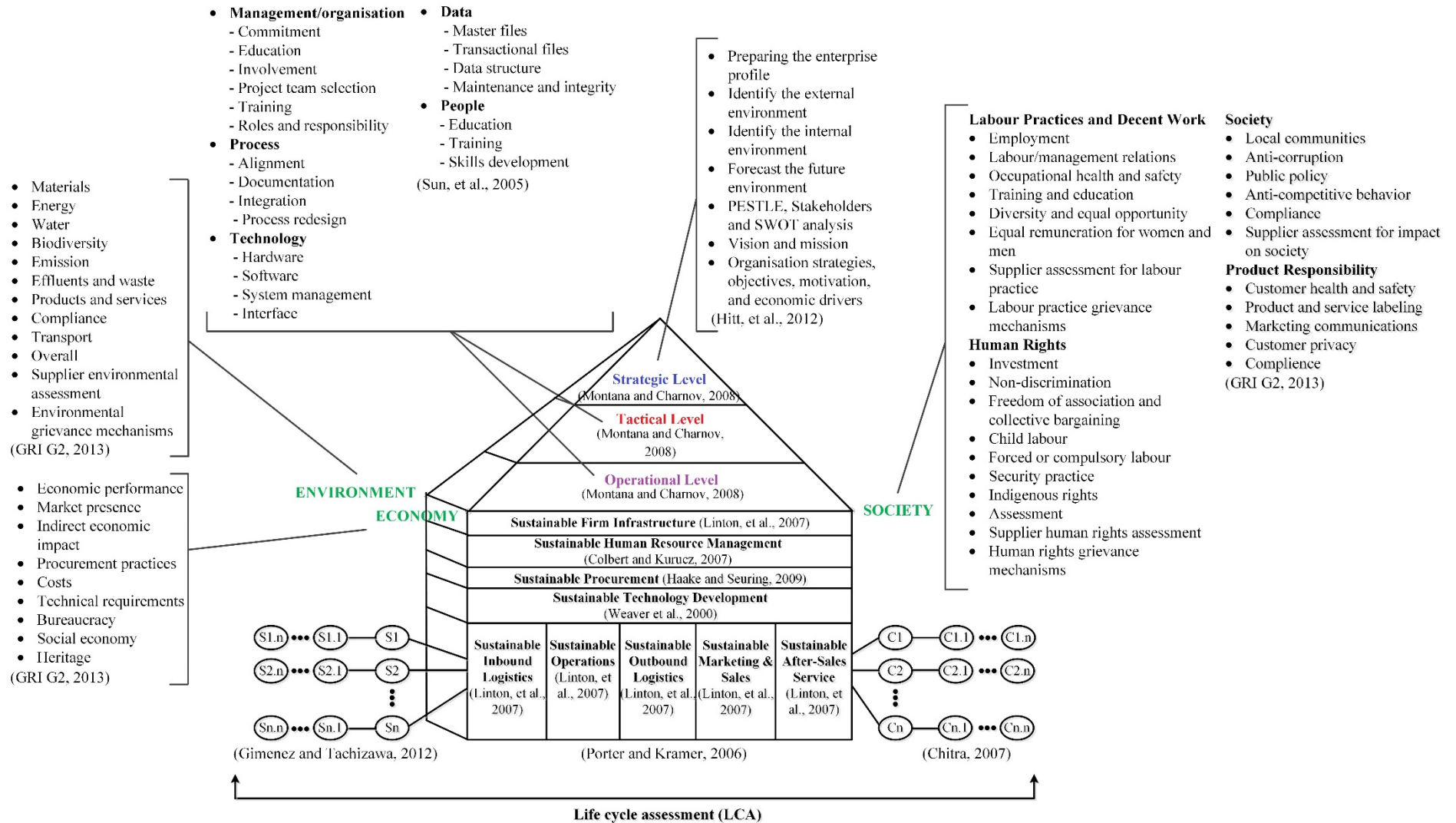


Figure 12. Framework for sustainability implementation portfolio

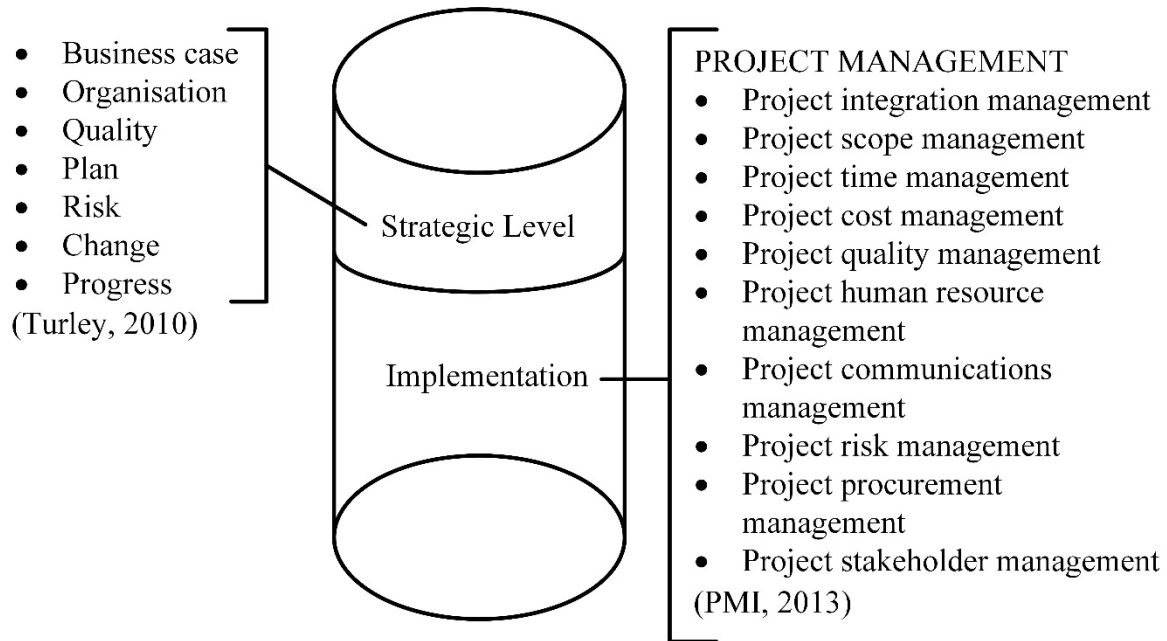


Figure 13. The framework of system implementation project

The S-ERP framework demonstrates numerous important aspects that require being envisaged for implementing the S-ERP system. The results reveal that the formation of the initial S-ERP framework needs to be modified and divided into two parts: a framework of sustainability implementation portfolio and a framework of system implementation project. In this case, organisations initially need to turn their value chains into sustainable value chains, then they can implement the S-ERP systems.

The framework of sustainability implementation portfolio consists of two aspects: sustainability paradigm (environment, economy, society) and decisional paradigm (strategic level, tactical level, and operational level). The operational level comprising the value chain components of an organisation.

The framework of system implementation project embraces two aspects: strategic level and implementation. Strategic level refers to a sort of strategic management process that is performed by top management level to define the strategy of the organisation towards the implementation of S-ERP system. In this process, the top managers should identify the business case, risk, and quality

in implementing the system. The outcome of this process is the system implementation plan that needs to be managed using project management methods.

5. Discussion of the Results

The evaluation of the initial S-ERP framework aims to confirm the usability and validation of the framework. The experts' comments reveal that structure of the framework needs to be modified. The aspect of sustainability and decisional paradigms should be included in that sustainability implementation framework, whereas the system implementation framework should encompass strategy and implementation aspects. This idea can be seen from the following comments of Experts 7, 10:

“Where are the things operationally, tactically, and strategically you must do in the business that you are trying to support using the ERP. There is a miss match between the three things you got down below and the things you got around the sides. The things down below to do the operation of the business thing around the side of implementation the ERP. Maybe it is the label on the figure that’s wrong, this is a sustainable ERP implementation framework, it is not for the operational articulates.”

“I think there is a mismatch in the visualisation of the framework. The way is you need to separate the process between the business transformation towards sustainability and the S-ERP systems implementation. The sustainability transformation should include the sustainability dimensions and decision-making levels, whereas, the S-ERP implementation should include the strategic and system implementation aspects.”

Based on this argument, it is necessary to divide the initial S-ERP framework into two parts: 1) Framework of the sustainability implementation portfolio and 2) Framework of the system

implementation project. Figure 14 illustrates the modification flow of the initial S-ERP framework towards the final frameworks.

The decisional and sustainability paradigms are the aspects that should be considered in the sustainability implementation framework as it represents the general business transformation towards sustainability. The identified components of the initial framework should be modified. For instance, the components of the strategic level of the initial framework are appropriate for the components of the strategic level of the sustainability implementation framework. In this aspect, organisations need to prepare enterprise profile, identify the external and internal environment, forecast the future, and perform PESTEL (Political, Economic, Social, Technological, Environmental, and Legal) and SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis (Hitt et al., 2012). Based on these activities, the organisations develop the vision and mission which are aligned with the sustainability strategies. This amendment is performed based on the following comment of Expert 9.

“I am thinking of let say somebody follows your approach you know maybe consulting firms, maybe strategic part of the company and they fill out all this information and they really understand what are the factors and the PESTEL thing and the SWOT and the PEST analysis and they really gather all these stuffs. How do you know if you’re beginning in the mediate or advanced? How do you know what is the HR department supposed to do with this information? What is the product manager supposed to do? So to me the way you laying this out is the description of how things could work but it's not going for the customers for information is and are you trying to have this if you laid out of this information that it creates some kind of enlightenment or inside or changing behaviour or ability to do continues improvement or something like if you were able to map out of this strategic detail who would find the value to see laid out in this manner.”

In the strategic aspect of the system implementation framework, the organisations need to perform business case, define implementation strategy, and execute steering meetings and project sign-off. These activities are performed by committee members and managers in an organisation. This statement is according to the comment of Expert 11:

“That could be the business case that the company wants to look at. You know, people do not want to implement anything from a sustainability standpoint. You know just they want to implement it. If you look at ERP project surely those that typically done because of the strong business case on the value that the company drive from that implementation. In another word, you implement S-ERP, now you have a transaction system, you have a financial and accounting system, you have integration with your customers’ relationship management system, CPM, Pipeline and sale forth. Managers and suppliers, I mean these all kind of benefits that come with an S-ERP system, and obvious, very challenging because finding requirement for the company, in terms of the way you are conducting the business your partner and your customers, and your suppliers and you know your employees, at the same time there is extremely you know big significant benefit that complement.”

The components of the tactical level of the initial framework are suitable for the components of the tactical and operational levels of the sustainability implementation framework. The experts stated that there are two more dimensions that need to be considered in the implementation phase of the system implementation framework, namely change management and technology dimensions.

The components of the operational level of the initial framework are appropriate for the implementation component of the system implementation framework. The project management concept introduced by PMI (2013) can be used as the components of the operational level of the system implementation framework as they are generally used in the project implementation.

The project deliverables are identified to designate tangible or intangible objects that are generated as a result of the projects intended to be communicated to stakeholders. This modification is suitable for the comment of Expert 7.

“In operational, when you are not talking about operating, you are really talking about implementing. So think about it. You know it is a more accurate, precise word than operational.”

In addition, the operational level of the sustainability implementation framework should consider operational or routine activities in a value chain. One of the activities is related to the sustainability assessment, such as the Life Cycle Assessment (LCA) methods. Based on this credence, the extended sustainable value chain is considered as the operational level to describe the operational activities in the sustainability implementation framework. Expert 10 mentioned that:

“... your model does not include the other members of the value chain. So, again your model will tempt allow managers to think that if they design a brilliant supply chain that tracks of the mercury or plastic that particular company has control over those materials. They are now sustainable, whereas, in fact, that's not in the place at all.”

The experts argued that the sustainability indicators proposed by Fernández-Sánchez et al. (2010) must be replaced with the GRI G2 introduced by GRI (2013) as they have been generally used by organisations. The key benefits of using this GRI framework, in addition to standard reporting, are guidelines for material issues. The GRI emphasises that the company considers important environmental, economic and social aspects for its key stakeholders and has a significant impact on its business. This amendment is done according to the comments of Expert 2.

“What I would suggest to you as I said earlier about the impact look at GRI, G4 guidelines and that is along this sustainability aspect for the society, for the environment and the economy. If you put this, you have the only suggestion I have is since you work a lot in literature you could refer to an official reporting framework.”

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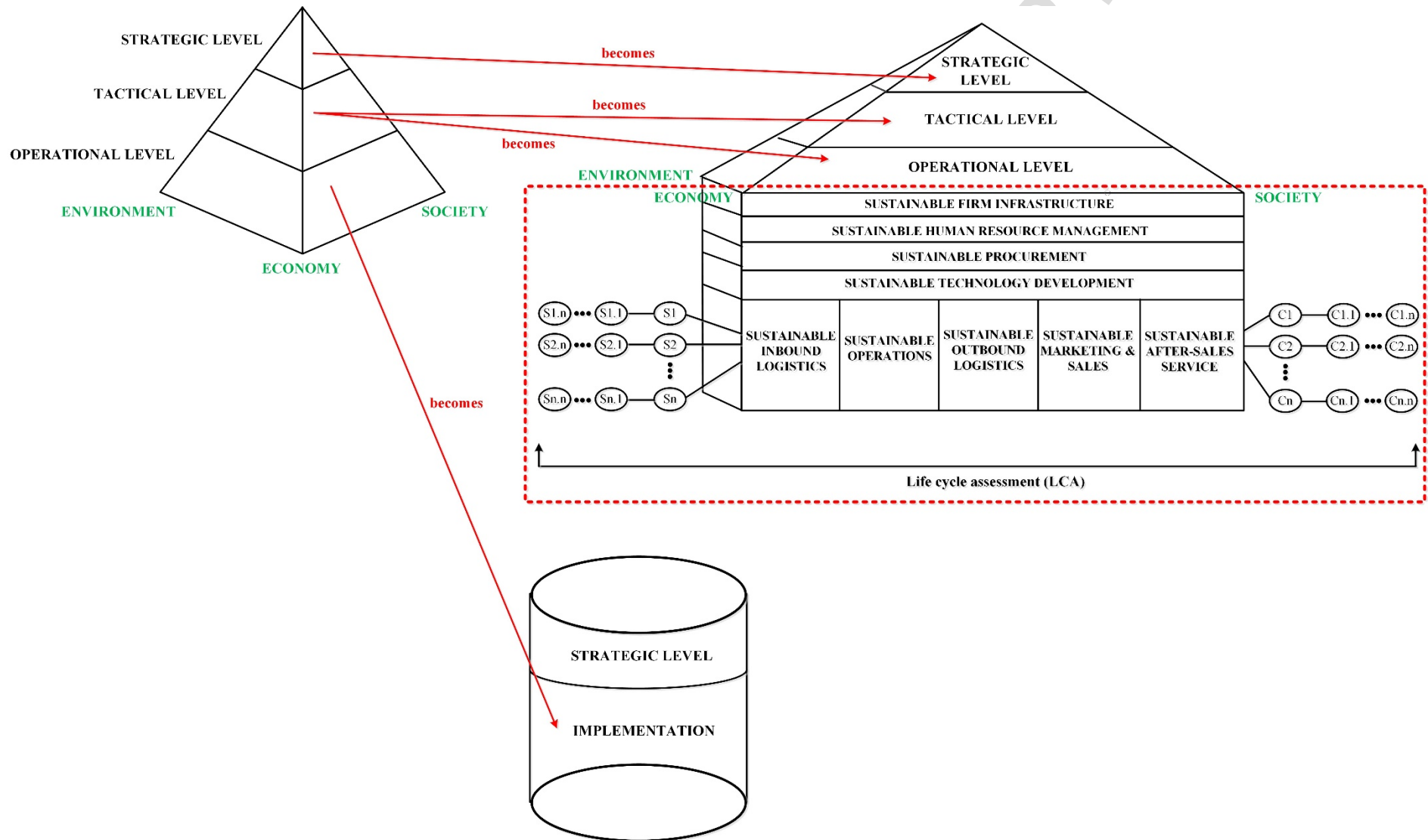


Figure 14. Modification flow of the initial framework towards the final frameworks

6. Conclusions

The content of the S-ERP framework is evaluated using peer review method, which involved 12 experts from sustainability and ERP implementation field for data collection. The peer review process enables the improvement of structure and quality of the framework. The collected data are then qualitatively analysed through three main activities: data reduction, data display, and conclusion drawing/verification. Accordingly, the initial S-ERP framework needs to be classified into two parts, namely sustainability implementation framework and system implementation framework.

The present study gives a significant contribution to academic and practice. In academic viewpoint, this study will improve the research growth in S-ERP systems implementation. The S-ERP framework fills in the knowledge gap and completes the structure of the S-ERP systems master plan. In practical viewpoint, the S-ERP framework is useful for organisations in practising sustainability. The framework provides the important aspects of transforming the organisations towards sustainable organisations and sustainably integrated organisations. By evaluating the S-ERP framework through experts, the quality and reliability of the framework have been improved. This is valuable for practitioners as they need a reliable technique to guide them in implementing the S-ERP systems. In addition, the implementation of S-ERP systems is advantageous for organisations in terms of decision-making process since the integrated systems can generally streamline the sustainable business operations and reduce the energy consumption up to 40 % (Monk and Wagner, 2012).

The supplementary study needs to be done with regard to the development of S-ERP guidelines to complement S-ERP master plan structure. A research on S-ERP systems implementation is significant to advance the sustainability activities, particularly in cleaner production. Another prospective research is the application of the S-ERP framework in a number of organisations as

a case study. This study would be valuable for the practitioners because it would show the results of the framework application in a real environment.

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