

8-6-2011

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Recommended Citation

Ahmed, M Daud and Sundaram, David, "Sustainable Business Transformation" (2011). *AMCIS 2011 Proceedings - All Submissions*. 356.

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Sustainable Business Transformation

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ABSTRACT

Sustainability is a complex concept comprised of multiple facets such as social, environmental, economic and more that challenges traditional norms of organisational practices. But there is a lack of generally accepted sustainability principles that is supported by most of the organisational stakeholders, and a pattern oriented methodology that is entirely backed by the organisational resources, in particular information systems. Decision makers are tackling ever-increasing difficulties for transforming a business into sustainable entity. This research proposes a multi-level sustainability business transformation (SBT) roadmap that supports the business for maintaining a consistent conversion process of existing operations into sustainable ones. The roadmap consists of discover and learn, strategise, design, transform, monitor and control phases that supports the life cycle from conceptualising sustainability issues to final implementation, monitoring, reporting, and controlling of sustainability. A Sustainability Modelling and Reporting DSS that supports all the decision making requirements for realising the SBT roadmap has been implemented.

Keywords

Business transformation, sustainability, business process modelling, roadmap, modelling systems, reporting systems

INTRODUCTION

Sustainable business management is a paradigmatic shift from that of traditional business management, aspiring towards the delivering of balanced and integrated performances in the three sustainability dimensions: social, economic and environmental. A business model that addresses win-win-win strategies for these sustainability dimensions is the means to successful assimilation and application of the sustainability concept into business management. Decision makers need to be guided by a coherent roadmap, and a modelling and reporting system that realise that roadmap, for managing a sustainable business lifecycle. A coherent roadmap is an overall view of the sustainable business management process, known as a macro-level lifecycle, and containing several high-level phases, each of which is a micro-level lifecycle, comprised in turn of many low-level steps.

There have been significant advances in business management roadmaps and frameworks such as: SIGMA Management Framework (SIGMA, 2001), Integrated Framework for Sustainability Reporting and Business Process Management (NZBCSD, 2002; WBCSD, 2003), AA1000 Framework (AccountAbility, 2004), The Natural Step framework (TNS, 2004), Sustainable Development Guidelines (New Zealand Government, 2003), Growth and Innovation Framework (Ministry of Economic Development, 2003), Sustainable Development Approach (Ministry for the Environment, 2002), Sustainable Progress Monitoring Plan (Statistics New Zealand, 2002), Sustainable Development Action Plan (New Zealand Government, 2003), Sustainability Journey (GEMI, 2006), Life Cycle Assessments (Adisa, 2006; Sustainability-ED, 2008), Adaptive Business Network (Heinrich & Betts, 2003), SAP Strategic Management Process (Norton, 1999), Strategic Development Process (Lynch, 2005), Model Driven Business Transformation Framework (Kumaran et al., 2007), ARIS Business Process Roadmap (Heidasch, 2007; Scheer, 1999), MIT90s Business System (Scott-Morton, 1991), and reporting frameworks (GRI, 2006; SustainAbility, 2001). The above roadmaps, frameworks, principles, guidelines and plans provide useful concepts for the development of a procedural oriented solution for sustainable business management. Key concepts provided include integrated approaches for the traditional management of businesses: formulation of strategies, designing of business processes and organisational structures, implementation of technological initiatives, and monitoring and controlling through reporting.

Many systems that have been developed for the traditional as well as the sustainable management of businesses possess ingredients that could be leveraged for the implementation of a sustainability modelling and reporting system. Key features and representative systems that support them are as follows: sustainability modelling and reporting (Bottomline³, 2006;

Ecological Footprint, 2003; Enviro-Mark, 2003; GEMI, 2006; SoFi, 2008; Sustainability ToolKit, 2003), enterprise management (SAP Business Suite, SAP Strategic Enterprise Management, and Oracle Business Process Analysis Suite), scenario driven modelling and decision support (iThinkTM, STELLA®, Clementine).

As discussed above numerous roadmaps, frameworks and systems have already been proposed for facilitating sustainable business process management and sustainability reporting management. They, however, do not comprehensively support a business management lifecycle, from an understanding of the relevance of the sustainability concept for business, to development of sustainability vision and strategies, to business process engineering, to implementation, to monitoring, controlling, reporting and continuous improvement. These roadmaps and frameworks are not supported by robust information systems; they do not incorporate useful models for the integration process and requirements of the sustainability dimensions; they do not prescribe how to identify inter-relationships and influences between modelling and reporting processes. Therefore, current sustainability decision making is silo-based, vision and strategies are not mapped to implementation activities, and sustainability modelling and reporting processes are uncoordinated.

Currently available systems that claim to support the roadmap steps for formulating, communicating, executing and monitoring the sustainability concept overlook harmonisation of sustainability modelling and reporting, and lack an overarching principle for integrating models from diverse paradigms and managing multi-dimensional data. These systems do not encompass the required level of support for adaptability, integrability, flexibility, extensibility and versatility for macro-level and micro-level decision making lifecycles throughout the sustainable business transformation.

To address the problems and issues identified above we propose a sustainable business transformation (SBT) roadmap in the following section. A SBT Roadmap can provide procedural guidance to the decision makers for maintaining a consistent process for conversion of a traditional business management system into a sustainable business system. The SBT roadmap provides a pathway from understanding the sustainability issues to identification of sustainability strategies to development of sustainable business processes and finally, implementation, monitoring and continuous improvement of the organisational sustainability statuses. The SBT roadmap is not sufficient by itself; rather it needs to be supported by the technologies such as, sustainability modelling and reporting (SMART) DSS for facilitating procedural and technological support to the decision makers for making decisions in each step of the roadmap during sustainable business model development. We developed the SMART DSS using design science principles (Hevner, March, & Park, 2004; Nunamaker, Chen, & Purdin, 1991) and describe it briefly in the penultimate section. We have tested our ideas using several real life business scenarios such as sustainable course delivery, sustainable transportation, and sustainable printing system of a tertiary educational institute. We discuss the applicability of the SBT roadmap to the case of the tertiary educational institute towards the latter part of this paper.

SUSTAINABLE BUSINESS TRANSFORMATION (SBT) ROADMAP

The SBT Roadmap targets end-to-end support for exploration of sustainability concepts, study of the related sustainable industries, capturing sustainable business strategies, business processes engineering to support the sustainability strategies, implementation of the re-engineered processes, and monitoring, controlling and continuous improvements of a business. The SBT Roadmap must show inter-relationships of the phases including step-wise sequential and parallel activities that need to be addressed during the transformation process. The SBT Roadmap supports the concepts provided by (NZBCSD, 2002; WBCSD, 2003). The roadmap defines what we need to do, who can do it, when it can be done, how it can be done, what technology could support the process, what outcomes the user can expect and how the user can analyse, test and use the artefacts. The roadmap must show pre-requisites of each step and activity, and explain how an activity can be fed to the next activity.

The SBT Roadmap: Meta View

The meta-level SBT Roadmap contains five high-level phases namely, 1) discover and learn, 2) strategise, 3) design, 4) transform, and 5) monitor and control. These phases are dependent on each other and their inter-relationships are illustrated in Figure 1. A phase derives the next phase and we can be trace back to the previous phase. Each phase is comprised of many steps that include many activities, tasks and operations. Therefore, we develop an extended view of the SBT Roadmap showing high-level roadmap activities as presented in Figure 2.

The SBT Roadmap: Extended View

This extended viewed roadmap supports the strategist, process designer and modeller to follow a series of activities for leaping onto the sustainable journey. The relationships among the steps are represented by connecting end step of each phase

to the first step of the next phase. In the following sub-sections, we describe required tasks, tools and technologies for undertaking the roadmap activities.

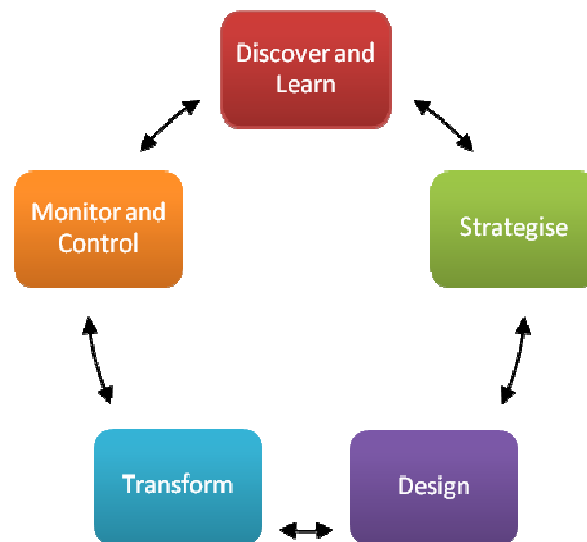


Figure 1. The SBT Roadmap: Meta-level View

THE SBT ROADMAP STEPS

Discover and Learn Phase

At the outset of the roadmap, the decision makers explore and learn sustainability ideas, business and related industry settings. The decision makers then document and analyse business scenarios using sustainability lenses, and identify and select a dysfunctional business scenario that is of high value for sustainability point of view. We propose seven sequential activities in this step. They are: 1) awareness of un-sustainability, 2) understand the business, 3) understand sustainability issues of the business, 4) document overall business scenario, 5) analyse the scenario using sustainability lenses, 6) sustainability vision statement, and 7) create sustainability vision statement.

Strategise Phase

In this phase, we explore the initial strategic options, build and simulate the sustainability models of the selected scenario. We then propose to analyse critical success factors and sustainability KPIs, identify sustainability issues that need to be addressed and finally, develop sustainable business strategies. In order to find out the sustainability requirements, the decision maker needs to study ethical and legal requirements of the business settings. The proposed steps in this phase are: 1) formulate and build sustainability model of the AS-IS business scenario, 3) analyse sustainability CSFs and KPIs, 4) identify problems, Issues and requirements for each sustainability dimension, and 5) Identify sustainable business strategies.

Design Phase

In this phase, the decision maker first designs the TO-BE sustainability scenarios along with the KPIs based on the newly developed strategies. The decision maker then defines the high-level end-to-end sustainability business processes, prepares plan and scope of the sustainability project, investigate gaps and map between the existing business processes with the newly developed processes; identify requirements of business process improvements (BPI) and business process reengineering (BPR); build, simulate and finalise the TO-BE processes model and their KPIs.

The newly designed processes may generate new data that need to be captured and managed using an updated database. Therefore, the modeller will need to design a new data model. The new processes may drop old functions and include new functions. Therefore, the modeller needs to develop a new functional model. In order to operate and manage the new process, the business may need new resources. The modeller needs to design the new organisation model commensurate with the newly designed process. As the data model, functional and organisation model could potentially be changed for the proposed

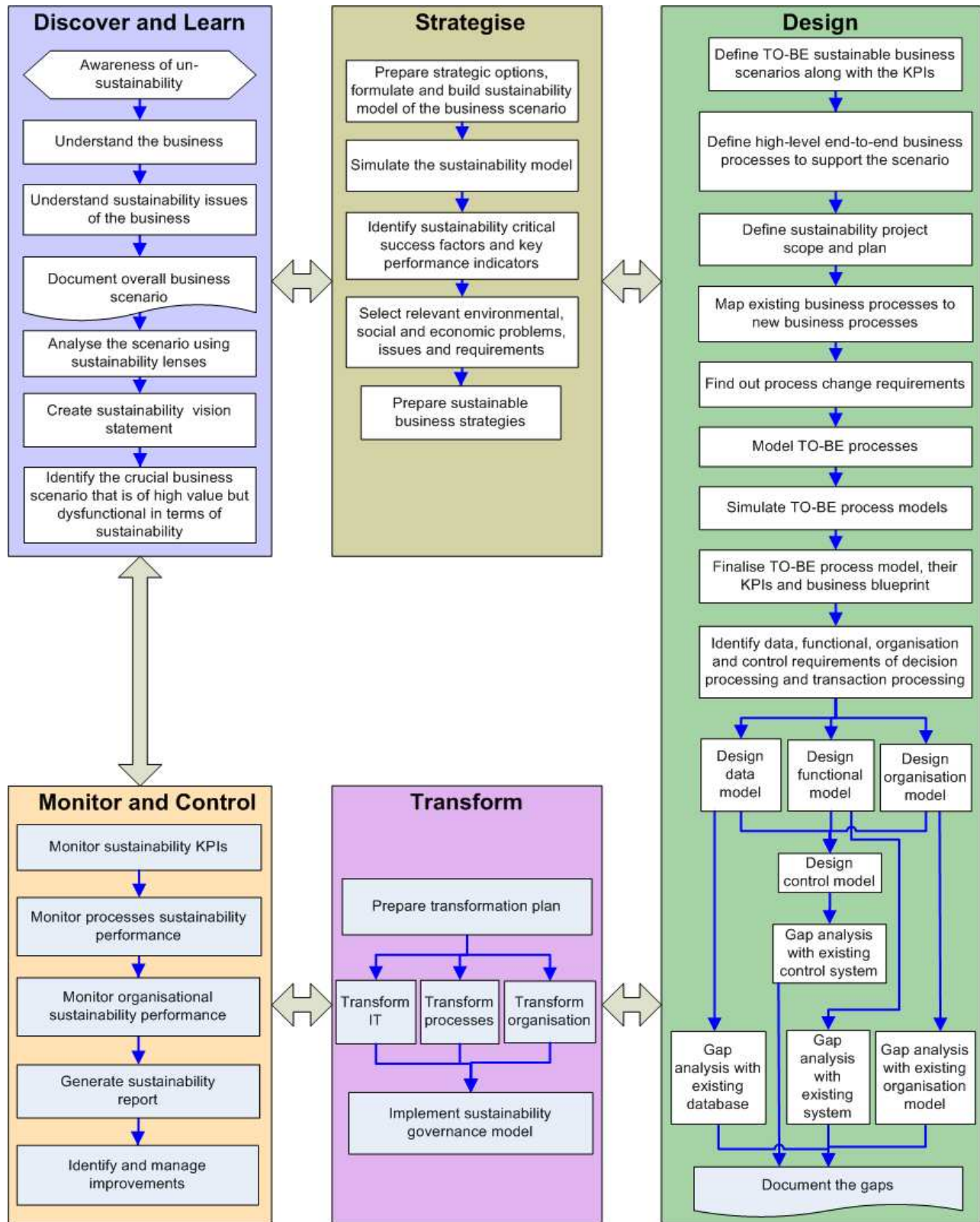


Figure 2. The SBT Roadmap: Extended View

processes, the modeller also needs to develop a new control model for proper monitoring and coordinating of data, functions and resources. The design activities also include comparison and analysis of the gaps between existing and TO-BE databases, functions of existing system with the new system, structure of current and proposed organisation, and current control mechanism with new transparent control and governance requirements. Based on the gap analysis, the decision maker prepares a gap analysis document for the data, functional, organisation and control models and highlights the required improvements. The step is completed with documentation of the gap analysis report, which is fed into the transform step.

Transform Phase

In this SBT Roadmap phase, the decision maker prepares and implements enterprise level transformation plan for increasing sustainability capabilities. It then conducts real activities for transforming the organisation, process and IT. During this step, the project manager prepares a project plan and change documentation, and undertakes physical transformation activities of the business processes, information systems and organisational structure as per the design documents. The businesses may need to restructure the organisation, hire/transfer employees to new roles, buy new /update existing information to match with the new business process activities. Finally, the organisation implements the sustainability governance model. Preparation and implementation of all the transformation plans can take place simultaneously and/or sequentially as specific to transformation requirements.

Monitor and Control Phase

After successful completion of the transform phase of the SBT Roadmap, the business runs its normal operation, continues to monitor, and prepares reports on performances of the Sustainability KPIs, business processes, and organisational sustainability. The decision maker then identifies and manages any performance gaps and undertakes new initiatives for enhancing sustainability performances with a new journey from the beginning or any step of the SBT Roadmap. A managerial team headed by a top leadership member oversees monitoring, reporting, controlling and continuous improvements of the sustainability performance. Effective change management is fundamental to ensuring that a company designs, builds, and delivers what it intends in conformance with all applicable standards and regulations. Change management ensures that proper review and approval is performed and accountability is maintained. The prime objective of sustainability reporting is not only to present the results of the annual business activities, performances and their impact on sustainability dimensions but also to disseminate information on how the organisation achieves such result. Therefore, the organisations must report at different stages of the transformation roadmap, at different levels of the organisations, and produce various types of reports (such as normative, transition, process and exception reports). The monitoring report will identify the gaps between the outcome and the expected value as well shortcoming areas and issues. Lessons learnt from the SBT Roadmap will be used to improve the sustainability statuses of the organisation.

APPLICATION OF THE SBT ROADMAP

This research explores realisation of the SBT Roadmap using the sustainable transportation scenario of a sustainable tertiary educational institute as part of the implementation, testing and evaluation of the research artefacts.

Sustainable Tertiary Educational Institute

A sustainable higher education institute should have a sustainability driven vision and strategic objectives. It must have a sustainable campus, delivers programmes that suits both the students and staff, meets the local and regional industry skills requirements, and supports socio-economic background of the students. The institute must work towards retention and success of its stakeholders and addresses to their needs. A sustainable campus should have low per capita ecological footprint, net zero carbon emission, low per capita energy use, useful and usable facilities for academic and other ancillary support, health and safety support, etc. The institute would work with other institutes, businesses and ancillary support providing bodies e.g. city council, etc. for transforming towards a sustainable institute.

The Business Case – A Tertiary Educational Institute

This roadmap has been analysed in the context of a premier tertiary education institute in New Zealand that provides education services in a region where most of the people belongs to low income category. The Institute works around five strategic priorities and directions. These directions are: 1) grow to meet regional needs, 2) continue to enhance successful participation, 3) strengthen Institute viability through improved internal business performance and practice, 4) continue to strengthen effective links to industry and the professions, and 5) build the professional reputation of the Institute.

During our investigation we identified the transportation system as crucial to fulfilling some of its strategic priorities. The transportation system scenario involved several business processes such as, parking facilities, course delivery, campaign, and forestation. We applied the SBT Roadmap to the transportation scenario and customised the SMART DSS system to support the sustainable transformation process.

Vision of the Institute

In its journey of the sustainable transportation arrangement, The Institute's visionary approach is to ensure a transportation system that supports high quality education delivery with minimum impact on stakeholders' social life and on ecology. This scenario considers transportation of various stakeholders and their impact on sustainable delivery of educational programmes.

The Transportation Scenario

The Institute's free car park facility creates high ecological footprint and leads to frequent use of cars that cause CO₂ emission. On the other hand, these facilities enhance quality-learning environment; students and staff can easily commute to and from the campus with less time and money. Therefore, the stakeholders are better off with time, money, and flexibility for education and social life. Quality education will have life long impacts on the students. The Institute makes a big capital investment amount each year and spends a large sum of money for maintaining the visible physical facilities, which create big impacts on the institute's financial capability. Therefore, The Institute reduces services that is not much visible to others such as, students' academic supports, library facilities, student learning centres, medical facilities, support to disable students, and staff training and research, etc. The Institute uses these extended supports for marketing purposes to attract more students, which facilitates increased income for the Institute. The Institute's strategic objective of providing free car park facility creates huge impact on the nature's environment. As part of The Institute's commitment to sustainable education campus, it has put in place several popular initiatives such as, 1) recycle waste, 2) Bike to campus, 3) use of timer switch for labs, classrooms and offices; but it never mobilises right resources or creates required business processes to support the campaign. It also neither evaluates the impact nor intends to investigate outcome of the campaigns in terms economic, environment and social KPIs. Instead of sustainability drivers, attracting more students (thereby earning more money) is the prime objective of its flexible course delivery initiative such as evening courses for employed students.

The stakeholders use their personal transport for attending any activities at the Institute's campus. This has created a huge impact on the environment. Stakeholders could use public transport to minimise the impact, The Institute could take some payment which could be used for mitigating the environmental impact. But that would create impact on stakeholders' especially students' social life and financial condition and also might have an impact on overall outcome of students' performance which may subsequently impact on number of students at the Institute and thereby the Institute's reputation and financial condition, which might cause staff redundancy and staff satisfaction.

The institute now wants to develop a sustainable transportation system so that it can provide maximum benefit to the students and staff, generate enough revenues to run the institute and mitigate the environmental issues.

Transportation Sustainability Roadmap

The generic SBT Roadmap can be customised for real-life business scenarios by adding information about the institute and its transportation scenario and developed the roadmap for transportation system transformation as shown in Figure 3. We describe the five main steps of the roadmap – discover and learn, strategise, design, transformation, and monitor and control below.

Discover and Learn Phase

The major activities of discover and learn phase are gathering knowledge about the criteria of sustainable tertiary educational institutes, and understanding, documenting and analysing education delivery and management system of the selected institute using sustainability lenses as shown top of the first column in Figure 3.

Strategise

The major activities of strategise phase are developing and simulating sustainability model of the transportation scenario, selection of social, environmental and economic problems, issues and requirements of the transportation scenario and preparation of strategic objectives as shown in the bottom of the first column in Figure 3.

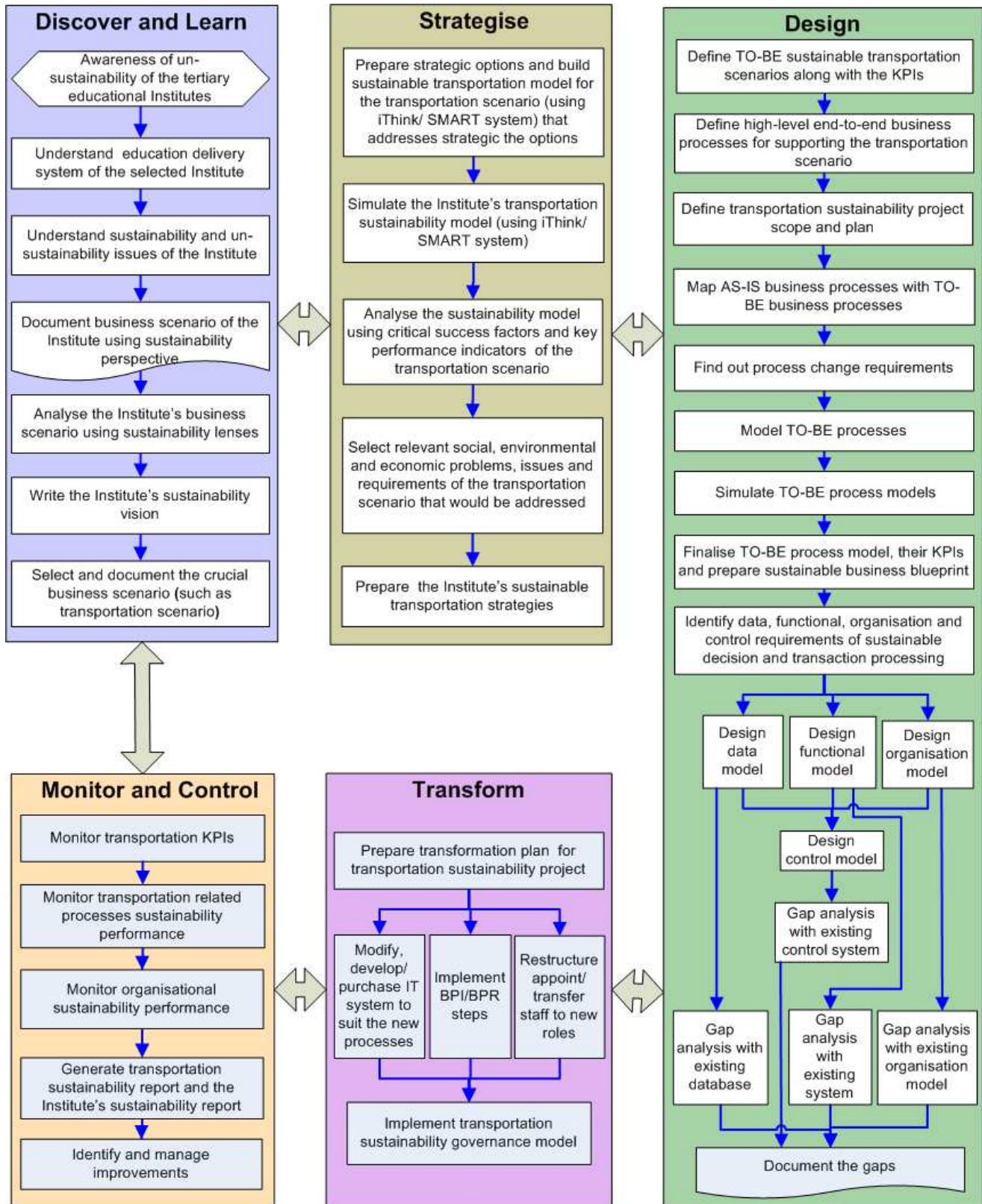


Figure 3. Transportation Sustainability Roadmap

Design

The design phase as shown in the second column of Figure 3 focuses on design of models for future processes, transaction and DSS data, function, organisation, and control related to the transportation system. Major activities of the future transportation scenario are identification of the KPIs, and definition of high-level end-to-end related business processes such as, sustainable campaign, car park, public transport, and course delivery to support the transportation scenario. It then defines sustainable transportation development project scope and plan, map existing business processes to new business processes and find out BPI/BPR requirements. The process modeller then develops and simulates models the TO-BE Processes of sustainability campaign, parking charge, forestation, course delivery, etc. using VISIO and Workflow Foundation (WF). The process modeller then finalise the business blueprint, the TO-BE process models and their KPIs for the related processes of the selected scenario. The next design activities are identifying data, functional, organisation and control requirements of decision processing and transaction processing for the Institute's transportation scenario, design of data, functional, organisation and control model; gap analysis of the respective models with existing database, information systems, organisation, and control system and document the gap.

Transformation

Activities of the transform step as shown Figure 3 are: 1) preparation of transformation plan for transportation sustainability project, 2) Restructure appoint/ transfer staff to new roles, 3) Implement BPI/BPR steps, 4) Modify, develop/ purchase IT system to suit the new processes, and 5) Implement transportation sustainability governance model.

Monitor and Control

Major activities of the monitor and control step of the transportation scenario transformation roadmap are monitoring performances of the sustainable transportation at various levels of abstractions such as KPI level, scenario level and institute level. It then identifies and manages improvement requirements.

A SMART DSS THAT SUPPORTS THE REALISATION OF THE SBT ROADMAP

We analysed the SBT roadmap and indentified the models and modelling methodologies that are required for developing the sustainable business blueprint using the framework development and model identification approach described in (Ahmed & Sundaram, 2008). The discover and learn phase primarily needs document and data models. The strategise phase involves sustainability, data and document models. The design phase involves process, data, document, organisation, domain, and scenario models. The transform phase uses process, organisation, data and document models, and the monitor and control phase uses report, document and data models. Therefore, the decision makers primarily need sustainability, process, scenario, data, document, organisation, domain, and report models for developing the sustainable business blueprint. Each of these models is developed and managed using different modelling paradigms and methodologies. For example, sustainability (simulation) models have been developed using both system dynamics modelling environment (iThink), third generation object-oriented language (.NET environment, VB.NET), and fourth generation database language (SQL Server 2005); process models have been developed using workflow modelling environment (such as windows workflow foundation).

We developed various architectural components independently and then integrated them to build the SMART DSS. The SMART DSS is used to implement a real-life decision scenario that supports capturing sustainable business strategies and creating sustainable business processes. The business processes are then modelled and simulated using the sustainable strategies and identify the sustainable business functions, sustainable organisations, and information systems. The combination of all these artefacts is the key ingredient of the sustainable business model. The SMART DSS framework and architecture support integration of the modelling paradigms and models within a single decision-making and support environment.

The main user interface of the SMART DSS closely resembles the high-level SBT roadmap as shown in Figure 4. It shows both textual and graphical representation of the five phases of the SBT roadmap. The *Report* menu item pulls all the stage reports including sustainability reports and ad-hoc reports under one heading.

Discover and Learn Steps of the SBT roadmap are implemented through two sub-menu items namely, *Directed Knowledge Discovery and Learning*, and *Undirected Knowledge Discovery and Learning*. The Strategise steps of the roadmap are implemented using *Sustainability System Dynamics Model* and *Strategy Documentation* sub- menus. The *Sustainability System Dynamics Model* sub-menu dynamically connects and imports the sustainability model at runtime that is developed using iThink. It dynamically generates model specific graphical user interfaces and supports simulation and scenario analysis for capturing the sustainability strategies. The *strategy documentation* menu runs a document modelling sub-systems for documenting the sustainability strategies and requirements. The design steps of the SBT roadmap menu are implemented

using eight sub-menus namely, *Process Model*, *Scenario Model*, *Object Model*, *Data Model*, *Organisation Model*, *Function Model*, *Business Blueprint*, and *Design Documentation*. These sub-menus support creation, simulation and evaluation of the models and finally preparation of the business blueprint.



Figure 4. Main Screen of the SMART System

The Transform items of the SBT roadmap are implemented using six sub-menus namely, *Key Documents*, *Project Scheduling*, *Organisation Transformation*, *Process Transformation*, *IT Transformation*, and *Transformation Status Report*. The *Key Documents* sub-menu presents all the design documents (such as Organisation, IT, Business Process and Control TO-BE models) to the decision maker and sustainability project manager. The *Project Scheduling* sub-menu supports the project manager for developing project plans. *Organisation, process and IT Transformation* sub-menus support transformation progress monitoring. The *Transformation Status Report* sub-menu supports preparation of the transformation reports. The Monitor and Control items of the SBT Roadmap are implemented using *Dashboard*, and *Monitoring and Controlling Report* Sub-menus.

The SBT DSS supports decision-making throughout every step of the transportation sustainability roadmap. We created two knowledge bases namely, a sustainable transportation related knowledge base and a sustainability concept related knowledge base. We linked the directed and un-directed knowledge discovery menus with these knowledge bases and the decision makers could interact with these knowledge bases without trouble. The decision makers were able to understand basic sustainability issues and sustainable transportation system easily. We then developed five strategic options and directions for the transportation scenario and developed system dynamics based sustainability models for each of the options. We then simulate and analyse the sustainability models using the SMART DSS, identified key strategic points, KPIs and CSFs for each strategic points. In the design phase, we designed a number of sustainability oriented processes. We simulated, analysed, refined and finalised these processes. We then designed other models namely, organisation, function, data and control models. We then compared the new process models with the current processes and documented the improvement areas. In this phase, the sustainable business project manager prepares implementation plan for organisational processes change, restructuring organisation, and establishing new information systems and then proceeds with the transformation process. The institute watches its sustainability key performance indicators (Figure 5) continuously and communicates achievements to the relevant stakeholders.

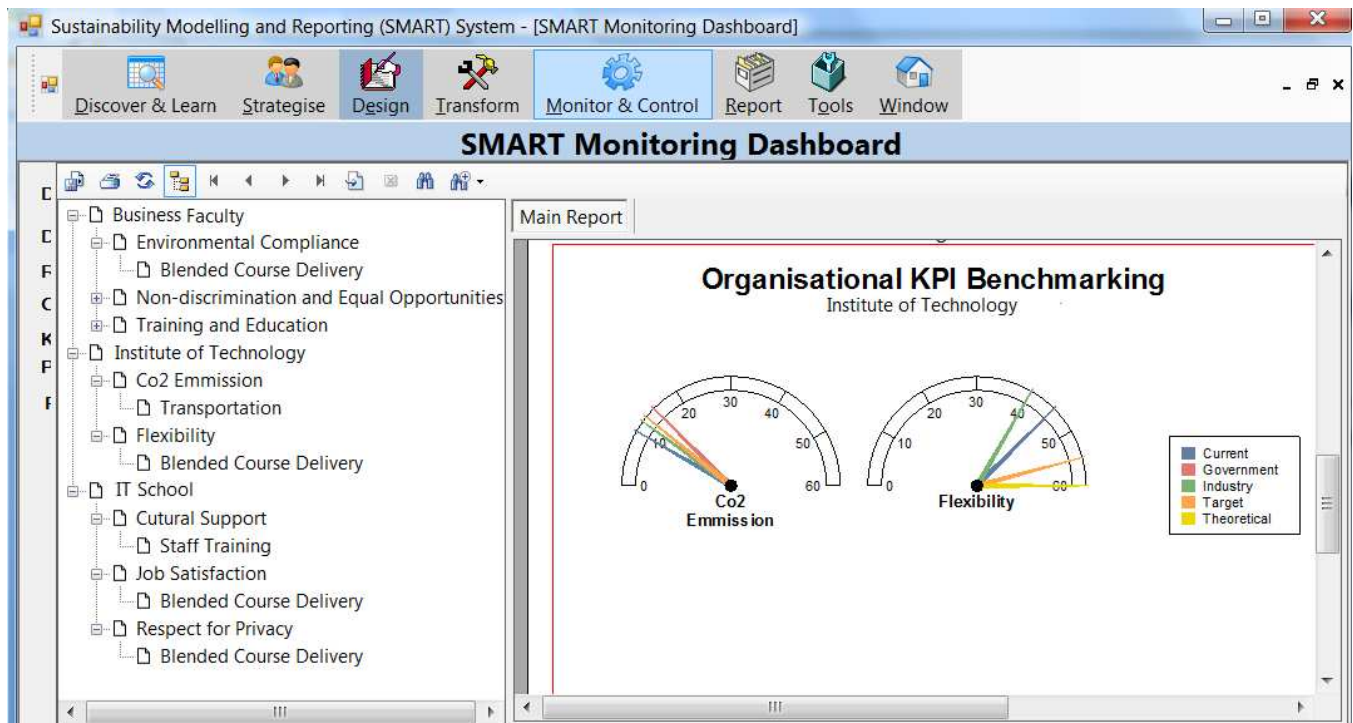


Figure 5. Organisation KPI Monitoring and Controlling Dashboard

CONCLUSIONS

This research proposes a complete integrated solution comprising of a procedural roadmap which is supported by a flexible and evolvable Decision Support System, namely the SMART DSS. This enables decision makers to understand sustainability concepts, devising sustainability strategies, transform and implement the business processes based on the new strategies and continuously monitor and communicate the sustainable business outcomes. The Sustainable Business Transformation roadmap is the key procedural document for guiding and controlling the decision makers for the development of a sustainable business model. The SBT roadmap activities are broadly categorised into five roadmap phases namely, *discover and learn*, *strategise*, *design*, *transform*, and *monitor and control*. The realisation of the activities is facilitated through a sustainability modelling and reporting (SMART) DSS. This research customised the flexible SMART DSS using the transportation roadmap and developed a specific DSS for the transportation system of a Tertiary educational institute. This Transportation DSS supports the decision makers for step-by-step progression using the roadmap for building the sustainable transportation model. The SBT roadmap is thus a generic procedural methodological document that is supported by the DSS methodologies, frameworks, architectures and systems. The Roadmap is customisable and suitable for application in any business domain. We have successfully tested the roadmap for several scenarios of a business using multiple iterations and implemented one scenario at a time rather than using a big-ban approach for transformation of the entire business processes in one go. Though there are risks of undertaking the whole business transformation as it will affect stability of the existing business processes and services. However, this big-bang approach could be achievable in small organisations.

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