

# Roadmapping System For Knowledge Generation, Storage, and Sharing

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## ABSTRACT

This paper describes a road mapping system for knowledge generation, storage, and sharing. It illustrates the theory and practice of road mapping. How the system is being used is also presented in a step-by-step format. The paper ends with discussing the process of generation, storage, and sharing of knowledge.

**Keywords:** Road mapping, knowledge generation, knowledge storage, knowledge sharing.

## I INTRODUCTION

In this section, the relevant concepts of road mapping are reviewed. The concepts of roadmapping have been widely adopted and extensively applied by many Western firms. They have proved to be useful ways of enhancing the performance of firms. Unfortunately, these concepts are still new to many Malaysian academics and practitioners. While academics are slow in terms of their research, managers are not quite prepared for paradigm changes in business management today that always adopt newly advanced management tools to improve performance. Therefore, the transfer of these new concepts and knowledge from the Western counterparts into Malaysian industry is slow. The motivation of this work is to explore the possibilities of adopting these concepts in future. It is hoped that these concepts can help Malaysian firms to improve their performance and transform themselves into global players.

## II THE THEORY OF ROADMAPPING

The core concepts of road mapping are laid on the theories in technology management, technology strategy and technology road mapping. Research in road mapping is widely available. Among all, is from the University of Cambridge. Robert Phaal, from Cambridge, has written a paper entitled "Technology road mapping – A planning framework for evolution and revolution" that illustrates the various format and concepts of road mapping (Phaal, et al., 2004). He and his peer group have described the theoretical ground and practical aspect of road mapping in a much detail way. He has also written a workbook entitled "T-Plan – The Fast-Start to Technology Road mapping: Planning Your Route to Success" (Phaal, et al., 2001) to help managers to apply the tool. A recent book entitled "Road mapping for strategy and innovation" (Phaal,

et al., 2010), has encouraged the use of road mapping technique among manufacturing firms in UK.

Road mapping is a flexible management tool that is widely used to support strategic planning. This tool provides a structured and graphical ways of visualising and communicating the links between markets, products and capabilities. It is believed that the road mapping concepts can help companies to survive in turbulent business environments.

Road mapping is not just a simple tool due to its complexity. It has a very complicated formats and structure. They lack of guidelines or processes of how to use it. However, many top-level managers like the complexity of the tool because it reflects the real situation that is in their mind. This is the reason why many CEO like to try this tool in their organisation but the resistant from their departmental managers remain high. Moreover, many managers are facing difficulty of using the tool due to its complexity, thus implementation of the tool in companies poses significant barriers and challenges

The theoretical ground of road mapping is based on the literature in technology management, technology strategy and technology road mapping. Among all, the literature on technology management that focused on technology management process (Gregory, 1995) and Motorola's technology roadmapping technique (Willyard and McClees, 1987) were among the influential papers in this area. Other relevant literature specifically on theories and concepts of technology road mapping can also be obtained from Barker and Smith (1995), Roussel et al. (1991) and Phaal, et al., (2001). The rapidly increasing literature on technology management has extended the concepts of road mapping, specifically the types and architecture of roadmaps has been enlarged. The purposes, graphical format, and processes have also been enriched.

According to the technology management research group in Cambridge, the traditional concepts of technology management addresses only the processes needed to maintain a stream of products and services to the market. However, better technology management needs the establishment of appropriate knowledge flows. The nature of these knowledge flows depends on both the internal and

external context, including factors such as business aims, market dynamics, organizational culture and technological context (Phaal, et al., 2004). Clearly, the literature on technology management highlight the important of knowledge flow in an organization.

Technology strategy is another concept of road mapping. Traditional view of technology management rarely addresses the fundamental issues of theoretical development in strategic planning for technology. Thus, a gap is existed within the literature of technology management. This gap can be filled by highlighting the importance of integrating technological plans into business strategy. Business strategy is about configuring the resources and coordinating operations of firms in order to sustain competitive advantage in the market (Porter, 1980; Prahalad and Hamel, 1991). A key premise is that a technology strategy should not be developed independently from the business strategy, but rather that technological resources should be linked to and support business goals (Matthews, 1992; Bitondo and Frohman, 1981).

Technology road mapping has been designed in order to operationalise the concepts of technology strategy into practice. In order to operationalise the concept of technology strategy, visualisation concept is adopted. The concept of road mapping built upon visualization concept. It is very helpful especially to top management of a firm. This is because top management today wants strategy be viewed from a high level and represented in just one diagram. Visualization concept serve as a 'visual' vehicle of thought can helps them to do this job. Visual representation technique provides new ways of examining and improving managerial decision making. The visual representation is a useful type of format for helping managers to make sense of complexity. Visual representation can simplify ideas and facilitate the transmission of complex ideas from individual to individual. Most importantly, visual representation helps to divorce ideas from specific managers, making them more accessible to debate and modification. Moreover, visual representations are of potential interest to managers because they are a means of displaying graphically the firm's current strategic position, as various departmental managers understand it, and because they hold the promise of identifying alternative routes to improving that position

Phaal, et al., (2004) emphasized that "the road mapping approach has been adapted by organizations to support many different types of strategic aims" They further illustrated, "technology road mapping concept is the use of a time-based structured (and often graphical) framework to develop, represent and communicate strategic plans,

in terms of the coevolution and development of technology, products and markets."

### III THE PRACTICE OF ROADMAPPING

This section describes the practical aspect of road mapping. As discussed earlier, road mapping concept has incorporated the theories of technology management, technology strategy and technology road mapping into its process can help companies to obtain maximum benefits from its implementation. Specifically, road mapping is designed to operationalise the concept of technology strategy. Its applications have resulted into many useful insight and helped companies to improve their performance. Many firms have implemented the technique and resulted in many useful and practical roadmaps with good and effective strategies.

One of the typical applications of road mapping is that company will usually transform the roadmap into computer generated report that consists of a roadmap, its relevant strategies and detailed illustration of future action plans. This computer generated report forms a knowledge management system for firm to generate, store, and share the knowledge. The knowledge management system that generate, store, and share knowledge has 5 steps:

- Step 1: Road mapping workshop
- Step 2: Analyzing the information
- Step 3: Computer generated roadmap
- Step 4: Action plans
- Step 5: Storage, retrieve, and share

#### A. Step 1: Roadmapping workshop

In the first step, a multi-functional team from a firm is formed. The team members should consist of representatives from various functional departments such as marketing, engineering and product and process technology. The team should also involve top-level managers. At this step, full support from top-level managers should be obtained. Top-level managers' support and involvement could enhance enthusiasm for attending the workshop, ensure time and resources are made available, and removed administrative and other barriers.

After the team is formed, team-building activity will be conducted to improve the relationships of team members. The focus is on building teamwork which could reduce human barriers, enhance ownership of the road map produced and reduce discontinuity of usage. This is a good solution to build the road mapping system into the current and larger organizational system organically. A

consideration of how to integrate the road mapping system into the people's system is vital.

After the team building activity, the next task is to provide formal training on the theories and concepts of strategic planning, technology management and technology road mapping. The purpose is to educate the team about background knowledge and concepts as well as the detailed process. At the end of this training session, the participating managers should be familiar with the terms used and the steps involved and able to implement the road mapping system with confident.

After that, the actual implementation of the road mapping exercise is carried out. In the mapping exercise, a strategy road map is constructed on a sheet of flipchart paper that attached to the wall. Strategies and business related activities and decisions were written on the post-it note and stuck on the roadmap at the relevant layer and time period on the wall. This exercise aims to map the company future strategic plans.

This exercise provides an opportunity for the team members to reflect their opinions and thought on the same platform. During the exercise, the top-level managers should seek to clear obstacles. It is expected that various obstacles may appear such as the non-cooperative behavior from team members. It is believed that top-level managers have the influence and power to remove these obstacles. That's why they are invited in the workshop. Figure 1 shows the activities of road mapping in a workshop.



Figure 1. Roadmapping workshop.

### B. Step2: Analysing the information

In this step, the participants are now required to link the information on the roadmap, bringing together the market, product, capability and resources of the business together to identify link on a final roadmap. Linkages between market, product and capability elements are recorded.

In this step, data collected from the roadmap is analyzed. The data generated here can turn into two inter-linking analysis that provide mechanisms for spanning the roadmap layers. Arrows were used to shows connections among strategies and business related activities and decisions. Figure 2 shows how the strategies are linked to each other.



Figure 2. A strategy roadmap.

### C. Step3: Computer generated roadmap

In this step, the roadmap generated from the previous steps is transformed into a computer file. The diagram below shows a sample file of a computer generated roadmap (see Figure 3).

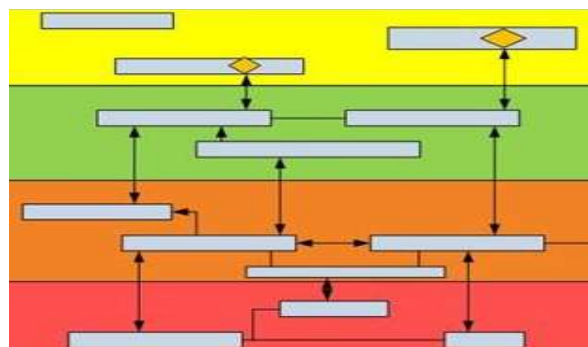


Figure 3. A Computer generated roadmap.

### D. Step4: Action plan

In the fourth step, an action plan will also be produced. The action plan is produced based on the discussion in the workshop. Together with the computer generated roadmap, the action plan forms a road mapping report that describes the future strategic plan of a company. The report usually consists of (but not limited to) the following contents:

A. Executive summary

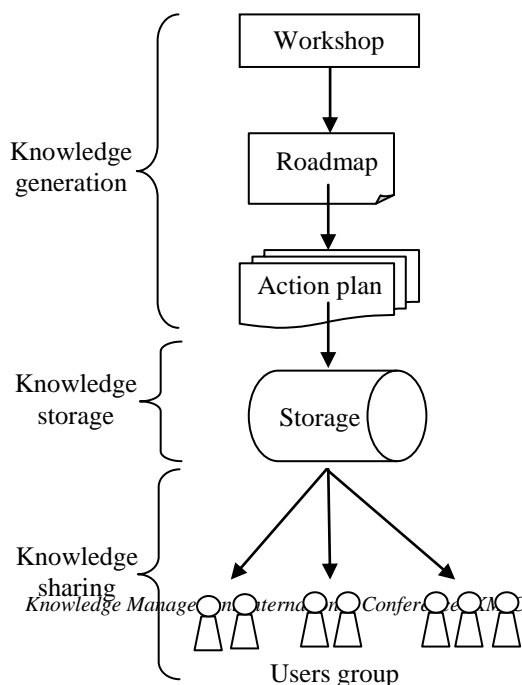
- Overview
- Vision and mission
- Trend and drivers
- Evaluation criteria
- B. Detailed roadmap landscape
  - Format and structure
  - Market, product, capability and resources
  - Linkages
- C. Roadmap detail content
  - Future needs and challenges
  - Priorities
  - A roadmap to the future
- D. Summary
  - Next steps
  - Action Plan
  - Participants

The road mapping report will be stored in the computer as a form of knowledge management system for reference in the future.

**E. Step5: Storage, retrieve, share**

The fifth step is to store, retrieve and share the road mapping report with the related departments or individuals from the organization.

In fact, the greatest value of the road mapping tool is not the immediate outputs, but rather the following activities to retrieve and share the knowledge with other parts of an organization (users group) in order to communicate the company plans and coordinate the relevant activities (Figure 4).



**Figure 4. A Knowledge management process.**

Therefore, in order to avoid a ‘one-off’ process, the management of the company should use it as a knowledge management system effectively. They should identify the departments or individuals need to be connected. Allow them to access to the road mapping report. They should also develop an information sharing system within the company to use the information. Policies should be developed to systematically make use of the information.

Together with the workshop activities, the knowledge management system can be used to generate, store, and share knowledge among departments and individuals in an organization. The diagram in Figure 4 illustrates how this system functions as a knowledge management system (see Figure 4).

Application of the road mapping tool has provided a number of insights into aspects of knowledge management which add to academic understanding and could form the basis of further work. The following section discusses the wider implications of the system for managers and academe.

**IV DISCUSSION**

Although the underlying theories and practices of road mapping are not new, its application in the form of a road mapping system provides an effectively way to generate, store, and share knowledge among individuals or departments within an organization. It plays an important role in a firm as a knowledge management process that provides a practical, usable and useful system for managerial decision making.

Far too often managers have faced information overload in a company. Companies might spend significant time developing a long list of strategies and objectives, which are then passed down to a manager to carry out. As there is a lack of tools to enable managers to generate, store, and share the right information, they will tend to end up with too much of strategies, aims, objectives. As a common sense, managers will re-define the boundary of strategic planning; based on the areas they are familiar. This is understandable, as faced with complexity, and the need to act, managers will tend to seek the comfort of the known. A formal road mapping system provides a mechanism for combating this tendency. In this system, it was showed that managers are guided by the steps of the knowledge generation, storage and sharing system.

The system helped managers to decompose the complexity of understanding and managing information into manageable steps.

Furthermore, the developed strategy roadmap assist managers to better understand their company future direction. The value of multiple participations in the workshop was also demonstrated. Group discussion, challenge and review helped them to crystallize their thoughts and reduce inconsistencies at each step of the time.

The steps of generating and storing the road mapping report gave managers new insights into not only the way the information is used, but also into the way in which their colleagues share, and perceived the similar information in the same platform. These aspects of learning were considered valuable.

The system is educative, it encourages learning both at an individual and group level. By iterative modeling and group discussion, managers learn, modifying their understanding, ideas, beliefs and even their thought over time. The road mapping report developed provides a way of recording, storage, disseminating the strategies of an organization in a way that can be easily retrieved or accessed. This allows a knowledge management system to be built up over time, and revisited and amended as changes occur.

One of the most challenging tasks in company today is the handling of too much information – information overload. Too much of information generated from a strategic planning workshop, in a practical sense, is very difficult to analyze. This tool has therefore been concerned with ways of handling ‘messy’ information in effective ways. Complicated business strategies have been regarded as a complex issue. This research has proposed a knowledge management system for handling them. The system consists of a road mapping workshop to generate relevant strategies. The strategies are then to be displayed on roadmap. The roadmap is then transformed into data storage system with action plans and reports. The roadmap and report enabled the complexity of information to be reduced to a level that can be analyzed by managers. This provides managers a holistic view of their company strategies and future directions and helps them in managing their company better.

The main benefit of this knowledge management system is that it results in knowledge that is directly applicable to industry (e.g. in the form of a roadmap and action plan). In this sense, managers can use this knowledge without having modified it or adapt it to their situations. Furthermore, the documented outputs using the system could be retrieved for

future usage. Moreover, the road mapping workshop enables capturing of data that cannot be captured by other means. In other words, the advantage of this system over other tools or technique is obvious.

To summarize, the road mapping tool can be used as an effective knowledge management, to generate, store, and share business strategies. The roadmap combines the workshop approach for the whole road mapping exercise provide a way of generating useful and relevant data from companies’ managers. It is successful in helping company managers to generate relevant strategic information for analysis. It enables integration of company managers’ views, allows communications and clarification of information, and facilitates the identification of the most important business strategies having traded-off those less important ones. By using inputs from the managers, the system allows the development of strategic roadmap based on accurate and valid data. This shows that the system provides greater benefit and capability than many other strategic planning tools.

The key feature of the system is its ability to continuously generate knowledge, store knowledge, and share knowledge in an organization. Organization can change or modify its strategies from time to time.

A system that can be used for strategic planning and knowledge management allows managers to kill two birds with one stone. This kind of combined technique in management is rare and unique.

## V CONCLUSION

This paper has introduced a new knowledge management system for generating, storing, and sharing of business strategies. The purpose of drawing the system is to capture the complexity of business strategies in a simple and easy to understand way. This research leads to the development of a knowledge management system within a wider organizational information system. The paper has revealed and crystallized the road mapping system into an information system. An effective information system can be critical to company performance. It provides a database that provides practical guidelines and policy to enhance management practices. Roadmap is a form of codified knowledge that improves understanding about business strategy as it providing more descriptive, structured and visualized information for managers.

The system of knowledge management with road mapping is complex as it spans across many departments and involves many interrelated business strategies. The knowledge management

process proposed can assist managers to generate, store, and share strategies of firms, and helping managers to make complex business decisions. The research indicates that the knowledge management system has high utility and enabled managers to visualize and monitor the business strategies in a more easy way. The storage system provides a platform for managers to retrieve, view, share, and discuss their strategies into the future. Further research should be conducted to investigate wider applicability of the knowledge management system in a range of companies from different industries.

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