Information-driven Roadmapping for Strategic Planning: A case study in a Logistics Company

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Abstract

Many companies are facing the problem of fast changing trends in the market which require a huge amount of decisions to be made in order to increase their competitiveness. Roadmapping is one of the well-known approaches for strategy planning. This paper presents an information-driven roadmapping (IDRM) method by incorporating outside-in (i.e. external business environment) and inside-out (i.e. company) perspectives which provide the company certain investigation with environmental monitoring and self-assessment of the capabilities for strategic planning. The proposed IDRM method aims at addressing the market evolution (i.e. ecosystem), business evolution and business/operation model of the selected stakeholders in the ecosystem in macro, meso and micro views, and is also concerned with the implementation of the inside-out roadmapping process for strategic planning. The proposed method was fully implemented in a global logistics company.

Keywords: Technology Roadmapping; Information-driven; Strategic Planning; Service Industry; Technology Management

1 Introduction

Changing markets and technology, driven forward by innovation, affect everybody's business. Various companies are increasingly paying attention to roadmapping in their market and technology activities for strategic planning. In a rapidly changing and dynamic environment, companies which are able to forecast and assess market and technological changes and trends can generate sustainable competitive advantages. Roadmapping is one of the well-known and flexible technology management techniques for supporting product and technology development activities with business and market opportunities (Groenveld, 1997; Phaal et al., 2004; An et al., 2008; Daim & Oliver, 2008; Gindy et al., 2008; Yoon et al., 2008; Froese, 2009; Gerdsri et al., 2009; Amer & Daim, 2010; Phaal et al., 2011; Carvalho et al., 2013; Gubbi, 2013; Zhang et al., 2016). Motorola was the first company to publish a technology roadmap providing

a 10-year view of radio products for cars (Willard & McClees, 1987; Phaal et al., 2005). In the 1990s, Philips Lighting applied a roadmapping method to generate 5-year product-technology maps for describing future customer needs in the field of product design (Groenveld, 1997). Roadmapping is a process of facilitating users to design a plan (i.e. roadmap) that matches short-term and long-term goals with specific technology solutions in order to meet business goals (Groenveld, 1997; Probert et al., 2003; Phaal et al., 2004; Wells et al., 2004; Daim & Oliver, 2008; Lee et al., 2009; Amer & Daim, 2010; Amadi-Echendu et al., 2011; Carvalho et al., 2013; Cheng et al., 2016). Technology roadmapping is also widely used in the energy sector in different countries (Daim & Oliver, 2008; Amer & Daim, 2010; Natalense & Zouain, 2013).

1.1 Technology roadmapping for product and technology planning

In the literature on technology roadmapping, many researchers and practitioners have been paying great attention to product and technology planning and development in their business activities for a few decades (Phaal et al., 2004; Fleischer et al., 2005; An et al., 2008; Gindy et al., 2008, Yoon et al., 2008; Froese, 2009; Lee et al., 2009; Gubbi et al., 2013; Li et al., 2015). Phaal et al. (2001) introduced the T-Plan as a quick start to the roadmapping process for implementing technology roadmaps. Eight types of roadmaps were identified for various purposes, such as product planning (e.g. product and technology development), service/capability planning (e.g. business-technology development), strategic planning (e.g. general strategic appraisal), long-term planning (e.g. foresight), knowledge asset planning, program planning (e.g. R&D planning), process planning (e.g. new product development) and integration planning (Phaal et al., 2004). Fleischer et al. (2005) applied a technology roadmapping technique for assessing emerging technologies (i.e. Nanotechnologies).

An et al. (2008) developed an effective product-service roadmapping method integrated with a Quality Function Deployment (QFD) technique for the mobile communications industry. Gindy et al. (2008) established an integrated technology roadmapping platform called STAR® for technology acquisition which consists of three phases including (a) setting up of an enterprise framework, (b) a technology data collection phase, and (c) a project creation and assessment phase. Yoon et al. (2008) proposed a roadmapping methodology for morphology analysis of products and technology which can be applied to incremental and radical innovations. Froese (2009) developed a research inventory of a research and development (R&D) activity using a roadmapping approach for the construction industry in Canada. Lee et al. (2009) proposed a technology-driven roadmapping method for patent analysis which consists of four maps: actor-similarity map, actor-relations map, technology-industry map, and technology-affinity map.

A technology roadmap of Internet-of-Things (IoT) applications was established by Gubbi et al. (2013). Li et al. (2015) integrated a roadmapping process into a bibliometrics technique to develop a framework for the emerging technology-based industry. Technology roadmaps are also widely used for the energy sector in different countries (Daim & Oliver, 2008; Amer & Daim, 2010; Natalense & Zouain, 2013; Li et al., 2015).

1.2 Technology roadmapping for strategic planning

Besides, some researchers and practitioners are paying increasing attention to technology roadmapping for strategic planning in their business activities (Wells et al., 2004; Phaal et al., 2007; Farrokhzad et al., 2008; Geum et al., 2011; Phaal et al., 2011; Ford et al., 2012; Geum et al., 2014; Vishnevskiy et al., 2016; Zhang et al., 2016). Wells et al. (2004) demonstrated how a strategic technology roadmapping process could be applied in a service-based organization (i.e. Royal Mail) in the UK for strategic planning and decision-making. Phaal et al. (2007) proposed a workshop-based roadmapping method (i.e. S-Plan) as an innovation and strategic planning process based on the fast-start roadmapping approach (i.e. T-Plan) developed by themselves (Phaal et al., 2004). Farrokhzad et al. (2008) conducted a portfolio-based roadmapping process to provide a technological solution for innovation business planning at Siemens.

Geum et al. (2011) proposed integrated product and service layers into a technology roadmap for strategic planning from a technological perspective in Korea. Phaal et al. (2011) provided a framework for mapping current and future emergence of technology-intensive and product-based sectors based on the concept of roadmapping which acts as a basis for supporting future-oriented strategizing and innovation. Ford et al. (2012) applied a qualitative method (i.e. interviews with experts) as the data collection tool to obtain intelligence (i.e. tacit knowledge) for supporting future-oriented roadmapping activities. Geum et al. (2014) proposed a technology roadmapping method integrated with scenario building and system dynamic simulation to support the scenario planning of a car-sharing service. Vishnevskiy et al. (2016) proposed an integrated roadmap methodology to facilitate the assessment of innovation strategies (i.e. the most effective application areas) in order to achieve strategic goals. Zhang et al. (2016) proposed a strategy-driven technology roadmapping method by using science, technology and innovation textual data.

1.3 Summary

On the whole, the existing technology roadmapping methods help researchers and practitioners to implement product and technology planning as well as strategic planning, respectively. However, there are two major challenges of the technology

roadmapping methods found in the literature. One of the challenges is a strong technology-push view. Many previous studies demonstrated that technology roadmapping can be implemented successfully in product and technology planning, as well as strategic planning on a case-by-case basis. The traditional technology roadmapping approaches mainly focus on technology planning, and development can be aligned with product development in order to meet specific goals in business activities. Amadi-Echendu et al. (2011) conducted a survey study on the practice of technology planning and the results also indicated that technology roadmapping is more appropriate for technology-intensive industries/companies to implement technology planning in the technology-push view. For service-oriented industries/companies, technology roadmapping may not be suited to implementing technology planning in the market-pull view. The main reason is that service-oriented industries/companies mainly attempt to use or apply market-available technologies to their products or processes in their business activities while technology-intensive industries/companies mainly focus on the design and development of new/emerging/advanced technologies in relation to their products or processes in their business activities.

Another challenge is the expert-driven roadmapping process. Most of the existing roadmapping processes rely heavily on expert knowledge, experience and opinions (Lee et al., 2008; Carvalho et al., 2013; Cheng et al., 2014, 2016; Geum et al., 2015; Zhang et al, 2016) to implement the process of technology roadmapping. Kanama & Kondo (2007) mentioned that the roadmapping process can only be successful when participants have comprehensive knowledge and good technical realization with a mature market/technology which provides rich information. The existing roadmapping methods assume that users have adequate information, knowledge and technical realization of the target markets/technologies. It reveals that the existing technology roadmapping approaches are appropriate for mature markets/products/services/technologies, but their applications for new or emerging markets/products/services/technologies are limited. Due to the limited information, knowledge and technical realization of new or emerging markets/products/services/technologies, it is difficult for companies as outsiders which are not yet dealing with the target market and technology to implement strategic planning using the existing technology roadmapping methods. For instance, they may spend a lot of time and resources on establishing a feasible framework of roadmapping at the beginning. That's why companies with inadequate information, limited knowledge and limited technical realization may not easily achieve their business goals using the existing roadmapping methods.

In order to address the key issues found in the existing technology roadmapping methods, this paper aims to present the design and development of an information-driven roadmapping (IDRM) method which incorporates environment-oriented (i.e. outside-in) and company-oriented (i.e. inside-out) perspectives which provide the company with environmental monitoring and self-assessment of the capabilities for strategic planning and technology development. By an integration of outside-in and inside-out approaches, environment-oriented roadmapping aims at conducting the certainty investigation of the target market to generate a series of outside-in roadmaps from macro, meso and micro views (i.e. market evolution, business evolution and business/operation model of the selected stakeholders) from an outside-in perspective whereas company-oriented roadmapping aims at implementing an inside-out roadmapping process to generate an inside-out roadmap for the assessment of the business operation model of the company with comparison of the selected stakeholders in the target market. The proposed IDRM method also provides companies with certainties and insights in terms of "where are they now" into how they can get ready to understand the market evolution of the target market (i.e. new/emerging markets), business evolution and business operation of stakeholders (i.e. potential competitors) in the target market, and capability of the company to enter the target markets.

2 Information-driven Roadmapping (IDRM) Method

The proposed information-driven roadmapping (IDRM) method for strategy planning aims to establish a series of outside-in (i.e. environment-oriented) and inside-out (i.e. company-oriented) roadmaps for environmental monitoring and self-assessment of the capabilities which consists of four main phases, namely prerequisite preparation (Phase I), outside-in roadmapping (Phase II), inside-out roadmapping (Phase III) and dissemination (Phase IV). Figure 1 shows a framework of the IDRM method.

2.1 Phase I – Prerequisite Preparation

Prerequisite preparation is the first phase of the proposed method (i.e. Phase I) which aims to provide a preliminary discussion about the target market or technology to determine the company needs for the implementation of roadmapping as well as to provide the keywords and data sources for outside-in roadmapping. During the preliminary discussion, a list of issues are suggested to discuss so as to determine the company needs, such as:

- The target market/technology which they are looking for;
- The main issues of the target market/technology they are concerned about;
- An understanding of the target market/technology;
- An understanding of the stakeholders (e.g. market leader, competitor, government,

association, supplier, consumers) involved in or engaged in the target market/technology;
- market/technology trends;
- market/technology landscape;
- evolution of the target market/technology;
- maturity and availability of the target market/technology;
- key technology and skill competencies which are related to the target market/technology as competitive advantage;
- key opportunity and critical success factors;
- enablers and barriers relating to the target market/technology;
- enablers and barriers relating to the target market/technology uptake in the industry;
- business drivers;
- business strategy; and
- position and roles of the company in the target market/technology.

Since a large amount of secondary data is used to facilitate the outside-in approach in Phase II, a list of keywords about the target market or technology and the suggested data sources are expected deliverables in this phase. Various sources and types of data are appropriate for the implementation of the roadmaps in Phase II for environmental monitoring. Some of the suggested data sources (Lichtenthaler, 2004; Lee et al., 2010; Parida et al., 2012; Geum et al., 2015; Li et al., 2015) are shown as follows:

- Publications (e.g. technical peer reviewed journals, academic research information);
- Patents;
- Official Websites (e.g. company, government, industrial association);
- Companies' publications (e.g. annual reports, press releases);
- Government publications (e.g. Governmental foresight studies, statistic reports, press releases);
- Market research reports;
- World business and industry news;
- Forums; and
- Social network sites.

2.2 Phase II – Outside-in Roadmapping

Outside-in roadmapping is the second phase of the proposed method (i.e. Phase II) and aims to address the environment of the target market or technology in which the company is looking for an outside-in perspective. A series of roadmaps is designed for

the company to implement outside-in roadmapping from three levels of views including macro-view (Level 1), meso-view (Level 2), and micro-view (Level 3), respectively. The outcomes of the outside-in roadmapping are expected to provide the participants an outside-in perspective on the target market or technology. Table 1 presents a description of three-level outside-in roadmapping.

2.2.1 Macro-view Roadmapping (Level 1)

It is imagined that the business environment of the target market or technology is an ecosystem, and many stakeholders such as consumers, competitors, potential partners and market leaders are involved in the ecosystem who are continually interacting with each other and with the business environment of the target market or technology. Macro-view roadmapping is the first step of Phase II (i.e. Phase IIa) and aims to provide a clear picture showing the evolution of stakeholders (i.e. ecosystem roadmap) in the target ecosystem in order to identify the stakeholders in the ecosystem. The key procedures conducted in Phase IIa "macro-view roadmapping" are summarized as follows:

(a) Generate an ecosystem roadmap to show the evolution of the target ecosystem using the framework for the Level 1 roadmap;
(b) Identify stakeholders in the target ecosystem; and
(c) Select potential stakeholder(s) according to the purpose and scope of the activity.

In this phase, information collected in Phase I is used to generate a Level 1 roadmap. The roadmap is used to show the business evolution of the target ecosystem from a macro view. The framework for the Level 1 roadmap is designed as shown in Figure 2 and consists of three main components: timeline, business milestones and stakeholders. The timeline is used to show the actual/estimated time for business milestones to take place and various stakeholders in the target ecosystem taking business actions. Business milestones are proposed to indicate the significant events and important actions that happen in the target ecosystem. Stakeholders represent the person, organization, or party involved and who take actions in the target ecosystem. The roadmap may also provide a better understanding of the target ecosystem's evolution and stakeholders according to the following questions:

- What kinds of major task are engaged in the ecosystem?
- When do the major tasks happen?
- Who is involved in the ecosystem?
- What is the role of each stakeholder in the ecosystem?
- How do the stakeholders affect or are affected by each other?
- What is/are the essential component(s) in the ecosystem?

On completion of macro-view roadmapping, a level 1 roadmap will be generated to provide the evolution of the target ecosystem in terms of significant milestones, and stakeholders in the ecosystem can be identified as an outcome of the Level 1 roadmap. According to the objective and scope of the TRM activity, some potential stakeholders will be selected for further analysis in the meso-view roadmapping process, such as key competitors, market leader, and so on. Significant milestones related to the development of the ecosystem are studied. Stakeholders in the ecosystem are also found. Figure 2 shows the framework of the Level 1 roadmap with a timeline and the categorization of various elements.

2.2.2 Meso-view Roadmapping (Level 2)

By leveraging the outcome of the macro-view roadmapping, the meso-view roadmapping aims at providing a better understanding of the selected stakeholders in the ecosystem individually. Participants may choose any stakeholders who are involved in the ecosystem or they are interested in for further investigation from the meso-view. Some suggested criteria for the selection of the targets under investigation are shown as follows:

- Best practice stakeholder;
- Competitor;
- Stakeholder who targets the same market or technology;
- Stakeholder who shares the same segment (e.g. market, customer); and
- Stakeholder who has similar capability or core competence, etc.

The roadmap in Level 2 is the meso-view of the ecosystem at the level of individual stakeholder. The business evolution of the stakeholder in the past, present and future is investigated. Significant milestones such as history, current situation, and future plan of business development are the expected outcome of the Level 2 roadmap. One example of a level 2 roadmap is shown in Figure 3.

2.2.3 Micro-view Roadmapping (Level 3)

The roadmap in Level 3 is the micro-view of the ecosystem at the level of operations or functions of individual stakeholders. Micro-view roadmapping aims to provide a comprehensive study of the business or operation model of the selected stakeholder. Major components of the business model of individual stakeholders such as workflow, core operations/functions, and supporting operations/functions are investigated as the outcomes of the Level 3 roadmap.

2.3 Phase III – Inside-out Roadmapping

Inside-out roadmapping (Phase III) aims at providing a self-assessment of the capabilities of the target company and conducting a comparative analysis among the target company and the selected stakeholders. A workshop is conducted in order to develop inside-out roadmaps of the target company for self-assessment and comparative analysis. For self-assessment, the outcomes of inside-out roadmapping provide participants (i.e. the target company) a better understanding of the capabilities and insights for strategic planning which is concerned with technology management implementing the corporate strategy.

For comparative analysis, an inside-out roadmap is established using the same framework for an outside-in roadmap (i.e. meso-view and micro-view). An amount of primary data is used to facilitate the inside-out approach. Some of the suggested data sources are given as follows: (Cheng et al., 2014).

- Company official website;
- Published company information (e.g. annual reports, audit reports, company catalogues, press releases);
- Internal documents (e.g. business plans, ISO documents, project reports, R&D reports, technical reports, financial reports); and
- Internal database.

Furthermore, micro-view roadmapping also helps to answer the following questions:

- What is the role of the company in the ecosystem?
- What is the position of the company in the ecosystem?
- What is difference in capabilities (i.e. weaknesses and strengths) between the company and the selected stakeholder?

2.4 Phase IV – Outcome Assessment

Outcome Assessment is phase IV of the proposed IDRM method which aims at:

- Validating all the results of roadmaps with all the participants using a face-to-face discussion approach;
- Disseminating all the outcomes of the roadmapping to the participants by the facilitators; and
- Developing a strategy/follow up/action plan for the target market or technology according to the outcomes of roadmapping in order to facilitate decision-making.

In this phase, the outcome assessment also helps the participants to have a clear picture about where they are, what they need to further investigate and where they will go.

After the completion of the implementation of the IDRM method, all participants can conclude some recommendations for the target company that are related to their future business plan based on the result. As a result, the participants can make decisions according to the well-organized materials. By using different elements such as the linkages, enablers and barriers which are shown in the latest version in different roadmaps, the company can clearly locate where it is and what it needs to do for further investigation. Moreover, it might make decisions based on the results of the roadmaps. All the roadmaps need to be transformed into electronic documents. All the results of roadmaps will be presented to and shared with all the participants.

2.5 Data Processing and Charting

For the establishment of well-structured roadmaps, a method for data processing and charting is proposed and designed during the implementation of the IDRM method. Keywords and data sources which are suggested in Phase I are used to develop the outside-in roadmaps (i.e. Levels 1-3). By using the keywords of the target market or technology, a large number of documents can be found from various data sources for the implementation of the roadmapping. Required data relevant to the target market or technology are extracted from the document as described in Table 1. Metadata of the extracted data are also recorded for data categorization and charting use. The extracted data are categorized in two dimensions which include:

(a) By time (i.e. past event, present event, and future event); and

(b) By impact on the target market or technology (i.e. event with a positive impact, and event with a negative impact).

A framework of the roadmap including a timeline and categorization of different elements is shown in Figure 2. According to the date of the event, the text boxes are placed in position on the roadmap. Four basic legends are designed for roadmap charting as shown in Figure 4. A text box on the roadmap represents one event/ milestone relevant to the target market or technology. As shown in Figure 4, a text box with a solid outline represents past or present events and a text box with a dotted outline represents a future event. A rounded rectangular text box and a hexagon-shaped text box represent events with a positive impact and negative impact, respectively. The format and an example of a textbox for charting are shown in Figure 5(a) and Figure 5(b), respectively. The content of the event is centered on the text box. The reference numbers of data sources and date of event are marked on the top left corner and top right corner, respectively.

2.6 Customization of Roadmapping

Customization of roadmapping provides a flexible way to adapt and implement outside-in roadmapping (i.e. Phase II) easily depending on the understanding of the target market or technology. Basically, two dimensions are taken into consideration for customization, such as market maturity and technical realization. Four basic scenarios for customization in terms of market maturity and technical realization are shown in Figure 6. In terms of understanding of market or technology, the suggested scenarios are demonstrated in Table 2.

3 Case Study and Trial Implementation

To realize the capability of the IDRM approach, a case study was conducted in a Logistics company in Hong Kong. The target company named "Company A" is a Fourth-Party Logistics (4PL) company having the capabilities and technologies of its own company whereas other partners run the supply chain solutions which currently have more than 13,300 employees around the world located in 437 branches in 162 countries.

3.1 Background of the Study

Nowadays, trends in China's electronic commerce (e-Commerce) market are significantly increasing year by year. After China entered the electronic business (e-business) market, the amount of global e-business market has significantly increased from US$750 million dollars to US$760 billion dollars (Verot, 2013). The amount of online spending in 2012 was US$1.3 trillion, and e-Commerce in China is estimated to be worth more than e-Commerce in several countries (i.e. the US, the UK, Japan, Germany, and France) combined in 2020 (Globalization Partners International, 2014; Rauf, 2014).

The target company is also a full-service e-commerce provider delivering professional solutions for all areas of electronic commerce. It started to provide its e-Commerce services in Germany about a decade ago. It has already developed middleware called e-Commerce communicator which can connect to all involved Information Technology (IT) systems between customers and shops. The target company mainly provides front-end services (i.e. web shop design, content management and usability management) and back-end services (i.e. warehousing, returns, carrier management, reporting, customer services and financial services) in e-Commerce. For the front-end services, they are partnering with an existing platform for Europe, an open source for Europe and the world's biggest demandware integrator. For the back-end services, the target company provides its core services using its warehouse management system and

warehouse in Germany.

Nowadays, online shopping is a big trend in China. Many companies realize that this trend provides great opportunities for expanding their business. The target company also had fully intended to plan a market entry strategy of delivering e-Commerce Logistics services to a new target market (i.e. China). Despite it running e-Commerce in Germany for around 10 years and dealing with its core business for logistics, China is an emerging market for the target company to provide logistics services of e-Commerce. This case study is used to demonstrate the capability of the proposed roadmapping method for strategic planning so as to assist the target company to better understand the current situation of e-Commerce in China from an outside-in perspective and facilitate their inside-out roadmapping process with comprehensive information support for generating the future plan of e-Commerce in China.

3.2 Prerequisite Preparation of the Roadmapping Activity

Top management of the target company planned to enter the e-Commerce market especially the Business to Customer (B2C) market in China in 2012 and kicked off its e-Commerce project in China in 2013. With regard to the company's needs, the proposed roadmapping method was used for e-Commerce strategic planning in China based on a 10-year horizon (i.e. 2014 – 2023). The proposed roadmapping method facilitated the target company to develop a series of outside-in and inside-out roadmaps for e-Commerce in China over 10-year horizon (i.e. 2014 – 2023). This case study is used to demonstrate the capability of the proposed method for strategic planning.

In phase I of prerequisite preparation, Company A wanted to focus on business to customer (B2C) services for e-Commerce in China. Top management of the company conducted a kick-off meeting to initiate the roadmapping activity. They also invited participants in the company who would be involved in the roadmapping activity to attend the kick-off meeting. The proposed roadmapping method was introduced to all the participants. The company's needs were identified and are shown as below:

(i) To explore market evolution of e-Commerce in China (i.e. ecosystem) from the macro-view;
(ii) To conduct a study of business evolution of particular stakeholders (i.e. selected service providers) in the ecosystem from the meso-view; and
(iii) To investigate the business operations of the selected service providers for e-Commerce in China from the micro-view.

4 Results and Discussion

This section summarizes and discusses the results of the case study. Based on the company's needs identified in the process of prerequisite preparation, the target company would discover the e-Commerce opportunities in China such as ecosystem, business evolution, and operation of logistics services of the competitors. In this case study, the target company trial implemented the proposed method (i.e. phases I to IV) to develop a series of roadmaps, such as:

- ecosystem of e-Commerce in China (macro-view roadmap);
- business evolution of the selected companies (meso-view roadmap);
- operation of logistics services of the selected companies (micro-view roadmap); and
- operation of logistics services of the target company (inside-out roadmap).

4.1 Macro-view Roadmap - Ecosystem of e-Commerce in China (Level 1)

The framework of the macro-view roadmap for the ecosystem of e-Commerce in China was developed based on the following questions:

- What kind(s) of e-Commerce markets are available in the ecosystem of e-Commerce in China?
- Who are the service providers in the ecosystem?
- Who are the service consumers in the ecosystem?

In this case, the target company's aim was to focus on service providers in the ecosystem (i.e. their competitors). A macro-view roadmap of the ecosystem of e-Commerce in China was produced by the target company. Five major components of the macro-view roadmap classify those who are involved in the ecosystem of e-Commerce in China including B2C, Customer to Customer (C2C), B2B, payment platform and logistics platform.

Since the target company is focused on the B2C market in China, a list of milestones for the B2C market in China out to a 20-year horizon was created by using secondary data. Six milestones are described in the chronological order as follows:

- In 1992, the first e-Commerce platform in China started with the establishment of hc360.com which was also the first Business to Business (B2B) platform in China.
- From 1992 to 2000, originating from the e-Commerce platform offered by hc360.com, many companies started to engage in various business activities (i.e. front-end and back-end services) related to e-Commerce in China.
- In 2000, the dot.com bubble burst made the industry almost collapse; however, Joyo.com was established against the market in the same year and after two years,

Joyo.com established its own logistics services company to support its B2C platform.

- In 2003, SARS caused a positive effect on the market due to its infectious nature, i.e. many people had to stay indoors to avoid infection so individual customers start buying online. Alibaba.com realized the opportunities of the B2C market and launched the Taobao.com. In this period, almost all the companies generated impressive profits.
- In 2004, Amazon.com, the global market leader in e-Commerce, became aware of the attractiveness of the e-Commerce market in China. By using an acquisition strategy, Amazon.com acquired Joyo.com in order to enter the market. Joyo.com has been renamed several times until the current Amazon.cn.
- From 2010 to 2012, Alibaba group launched its own payment platform (i.e. Alipay) for all e-Commerce platforms in 2010. Alibaba group aimed to provide comprehensive services to its customers by 2011. Taobao diversified its e-Commerce services into three companies, namely Taobao (C2C), Taobao mall (B2C) and eTao (Chinese online shopping search engine). In 2012, Taobao mall was renamed Tmall to make a clear distinction between Taobao B2C and C2C services.

According to the milestones of the roadmap, many companies have engaged in B2C business activities in China, such as 8848, Amazon.cn, Dangdang.com, JD.com, Joyo.com, PPG clothing, Tmall.com, etc. By using the benchmarking approach, the market leaders have been found according to the market share in the first quarter of 2013. In the B2C market in China, the three market leaders are Tmall.com, JD.com and Amazon.cn. Tmall.com and JD.com are two of the largest local B2C market leaders as well as Amazon which is a foreign company that has entered the e-Commerce market (i.e. B2C) in China. In the back-end services such as payment platform and logistics services, Alipay and SF Express almost dominate online payment platform and logistics services as a market leader in China, respectively. Except for SF Express, UPS and DHL logistics are also market leaders who are foreign companies which have entered the e-Commerce market (i.e. B2C) in China.

According to the results of the macro-view roadmap, three stakeholders in the ecosystem were selected for investigation of their business evolutions and operations: SF Express, UPS and APL. SF Express is a market leader of logistics services in China. APL and UPS have similar business backgrounds as compared with the target company which is a foreign logistics service provider which has entered the B2C market in China.

4.2 Meso-view (Level 2) and Micro-view (Level 3) Roadmaps - Business Evolution and Operation

Since the target company is familiar with the business evolution of APL and UPS, but not SF Express, they would like to have an understanding of the business evolution of SF Express. On the other hand, they only focused on major events of business evolution of APL Logistics (China) and UPS (China) which are related to logistics operations.

Since there are different procedures and criteria between local and foreign companies when applying for premises and licenses to provide logistics services in China, the target company would like to have a better understanding of the business operations of logistics services for e-Commerce (i.e. B2C) in China in regard to the selected companies (UPS and APL). On the other hand, the logistics assets of SF Express are also of interest. Table 3 illustrates a framework for the meso-view and micro-view roadmaps.

In the business evolution of SF Express as shown in Figure 7(a), SF Express transformed from a company working with many partners to one that has rapidly developed its own assets. SF Express mentioned that its partners always took its customers and earned more profit for themselves when it shared its business with many partners. In order to sustain its business, it had to develop its own logistics practices. A logistics functions company which would like to survive in China should develop its own assets in order to avoid its partners acquiring customers from it.

In order to investigate the business operation of logistics services in China, six major components of this micro-view roadmap were identified, such as major events, logistics services, value-added services, logistics supporting system, data support as well as logistics facilities and licensing. Figures 8(b) and 9(b) show the micro-view roadmaps of business operation of UPS and APL in China, respectively. As shown in Figure 9(b), the business operations of the logistics services provided by APL are a reference case for the target company, since APL and the target company are also serving a similar group of customers as foreign logistics service providers.

Although UPS was the first global logistics company to enter the logistics market in China (see Figure 6), UPS was only allowed to transport products and goods domestically in 2012. Before the start of the front-end logistics which transport the products from the warehouse to customers, it could only provide logistics solutions to customers with import and export services. In other words, UPS could only provide port to port logistics services in China before 2012. As a result, it is important to reveal

their logistics solution platform in order to investigate the alternative when a global company cannot obtain a domestic transport license.

4.3 Inside-out Roadmaps - Operation Models

In Phase III, the target company established an inside-out roadmap of business operation for comparative analysis using the same framework for the micro-view (Level 3) roadmap in Phase II. Figure 10 shows the inside-out roadmap of business operation of logistics services of the target company.

Regarding the logistics services, which form the core business of the target company, gap analysis was used to realize the gap among its competitors (i.e. SF Express, UPS and APL). However, the target company is relatively weak in regard to logistics facilities in China. As compared to UPS and SF Express, the target company is relatively weak in regard to providing logistics services for individual customers. The target company does not own its own assets for transportation such as vans, trucks or airplanes. In China, fast and cheap logistics services are vital. As a result, the target company may need to develop its own fleet and logistics facilities for faster physical movement of products. The value-added services of the target company may also be strengthened as shown in Figure 10.

According to APL, which serves similar customers to those of the target company, it provides a wide range of value-added services such as supplier-managed inventory and commercial invoice removal. The target company may consider these value-added services or even provide new value-added services which can attract customers. Last but not least, the target company may also increase its data support for internal documents in order to serve a wider range of customers. HTML5 is suggested to be developed for data support in the future planning of the target company. This type of new data support for mobile services would be a competitive advantage among the other competitors in the development of mobile services.

4.4 Performance Evaluation of the Proposed Method

An evaluation form was designed for collection of feedback from the participants of the target company to evaluate the performance of the proposed method, and contained a total of five statements, as shown in Table 4. Based on a Likert-type scale, the respondents were offered a choice of five responses (i.e. strongly agree, agree, neutral, disagree, strongly disagree) to express how they agree or disagree with a particular statement. On the completion of the proposed method, the target company was invited to evaluate the performance of the method. According to the company feedback as

shown in Table 4, the target company strongly agreed that the roadmaps let them better understand the current situation of the target market/technology and agreed that the roadmaps provide rich information to support strategic planning. With regard to the deliverables of the proposed method, they also expressed that the proposed method helps them to have a better understanding of their company and provides a clearer picture of the whole ecosystem systematically from inside-out and outside-in perspectives. Secondly, the target company agreed that the roadmaps are useful to provide insights into the future trends and recommendations. As learnt from the selected companies, a series of roadmaps can help to reveal many hidden obstacles in e-Commerce in China in order to avoid making the wrong decisions. The comparative analysis of the level 3 roadmaps provide a quick view of what others have already done and vice versa and the target company may initiate the actions effectively for the enhancement of its capabilities. Thirdly, the target company agreed that it will keep on using the proposed method for strategic planning in the future, since they expressed that the outcomes of the study (i.e. roadmaps and recommendations) are useful and pragmatic for their strategic planning. Moreover, the target company also mentioned that it intends to update the content of roadmaps for the monitoring of the external environment and self-assessment of its capability periodically in the future.

5 Conclusions

Various companies are increasingly paying attention to the roadmapping approach for strategic planning in their marketing and technology management activities. Shortening time-to-market for products, gaining access to new technologies and enhancing innovation competencies are important for the adoption of roadmapping. The evolution of roadmapping is the result of a few decades of research. The literature review conducted in this study provides solid evidence that the traditional roadmapping approaches are implemented for product and technology planning as well as strategic planning respectively, but most of them favor participants who have a strong technology-push view, good technical realization and comprehensive knowledge of the target market or technology, especially for mature markets and technologies. Moreover, most of the existing roadmapping processes are expert-driven approaches, which are good for mature market/product/service/technology, but are not favorable for new or emerging markets/products/services/technologies.

In order to address the above ley issues found in the literature, this paper presents an information-driven roadmapping method (IDRM) by incorporating environment-oriented (outside-in) and company-oriented (inside-out) perspectives which provide the company with environmental monitoring and self-assessment of its capabilities for

strategic planning. The proposed roadmapping method was designed and developed to consist of four main phases, namely prerequisite preparation (Phase I), outside-in roadmapping (Phase II), inside-out roadmapping (Phase III) and dissemination (Phase IV). Prerequisite preparation aims to determine the company's need for implementation of the roadmapping as well as to provide the keywords and data sources about the target market or technology for outside-in roadmapping. Outside-in roadmapping mainly addresses the environment of the target market or technology the company is looking for from an outside-in perspective (i.e. macro-view (ecosystem), meso-view (business evolution), and micro-view (operation/function)). Inside-out roadmapping aims at providing a self-assessment of the capabilities of the target company and conducting a comparative analysis among the target company and the selected stakeholders. Outcome assessment also helps companies to have a clear picture about where they are, what they need to further investigate and where they will go.

The proposed IDRM method was trial implemented in a logistics company to realize its capabilities. The target company attempted to enter the e-Commerce market in China due to the huge business opportunities. The proposed method was applied to the strategic planning of the business to customer (B2C) services in China over a 10-year horizon (i.e. 2014 - 2023). By adopting the IDRM approach, an outside-in roadmap (i.e. Level 1 roadmaps) was generated to explore the market evolution of e-Commerce in China from a macro-view perspective. According to the results of the Level 1 roadmap, three service providers in the ecosystem were selected for further analysis. In the process of outside-in roadmapping, a series of outside-in roadmap (i.e. Level 2 and level 3 roadmaps) was built for the purpose of conducting a study of the business evolution and business operations of three selected service providers in the ecosystem from meso-view and micro-view perspectives, respectively.

In the process of inside-out roadmapping, an inside-out roadmap about e-Commerce in China was generated for strategic planning by the target company. As compared with the traditional roadmapping methods the target company used, the company made positive comments about the proposed IDRM method which is relatively effective and easy to use for information-driven investigation of the target market, even though it has less knowledge and technical realization of the target market. Moreover, it not only allows the company to externalize its insight into emerging markets for strategic planning as a one-off task, but also encourages continuous updating of the roadmaps for environmental monitoring from an outside-in perspective and self-assessment of its capabilities from an inside-out perspective in the future. This is particularly important when an enterprise attempts to manage market activities practically for strategic

planning and technology management.

For future work, it is suggested that the proposed IDRM process be conducted by using an automatic algorithm and computational approach, especially for outside-in roadmapping (Phase II). Since massive amounts of data are generated and consumed with the rise of the Internet, the preliminary outside-in roadmaps may be developed for environmental monitoring and capability assessment of the selected stakeholders by leveraging Information and Communication Technology (ICT). This helps the companies to explore business opportunities for strategic planning and technology development effectively and efficiently.

Acknowledgements

The authors would like to express their sincere thanks to the Research Committee of The Hong Kong Polytechnic University for providing the financial support for this research work under the Project No. G-UABL.

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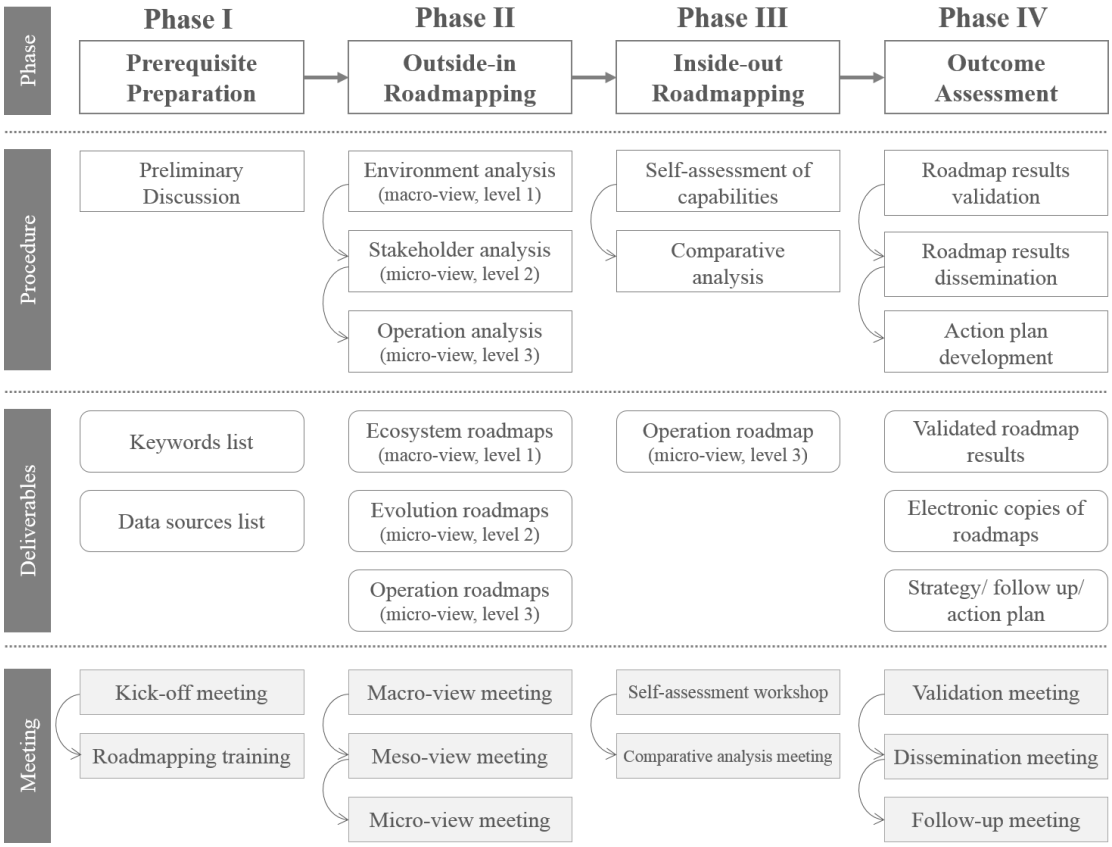


Figure 1 Framework of the IDRM

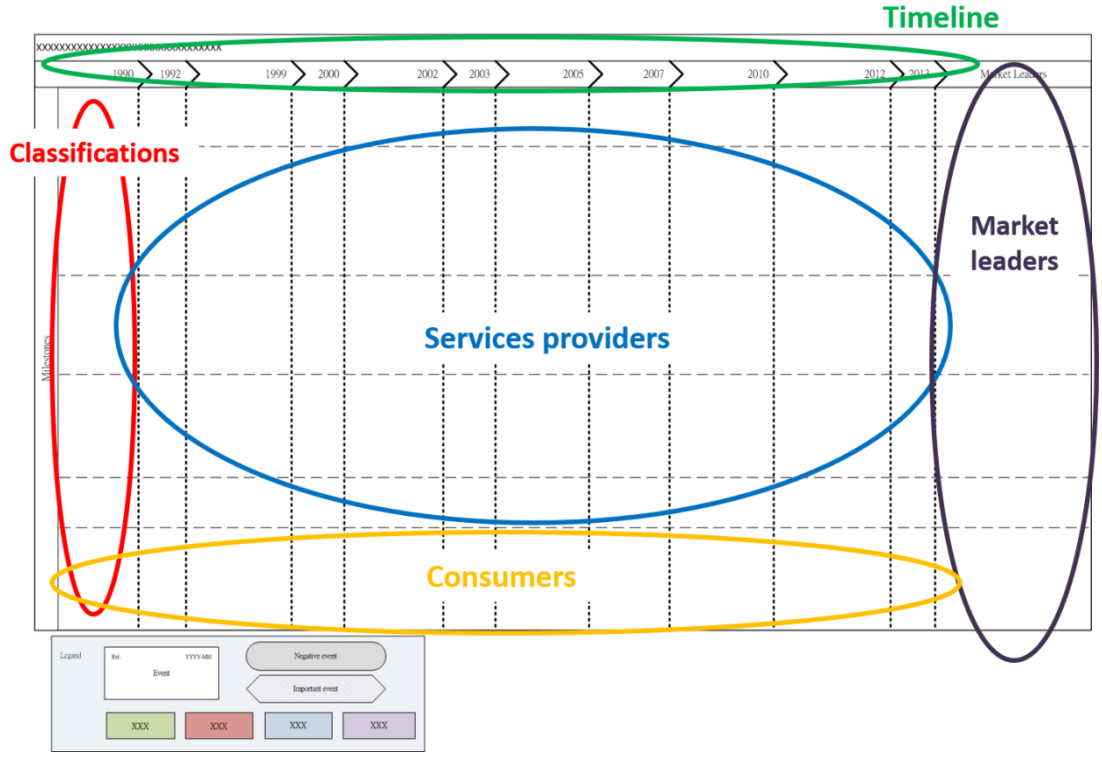


Figure 2 Level 1 Roadmap Framework

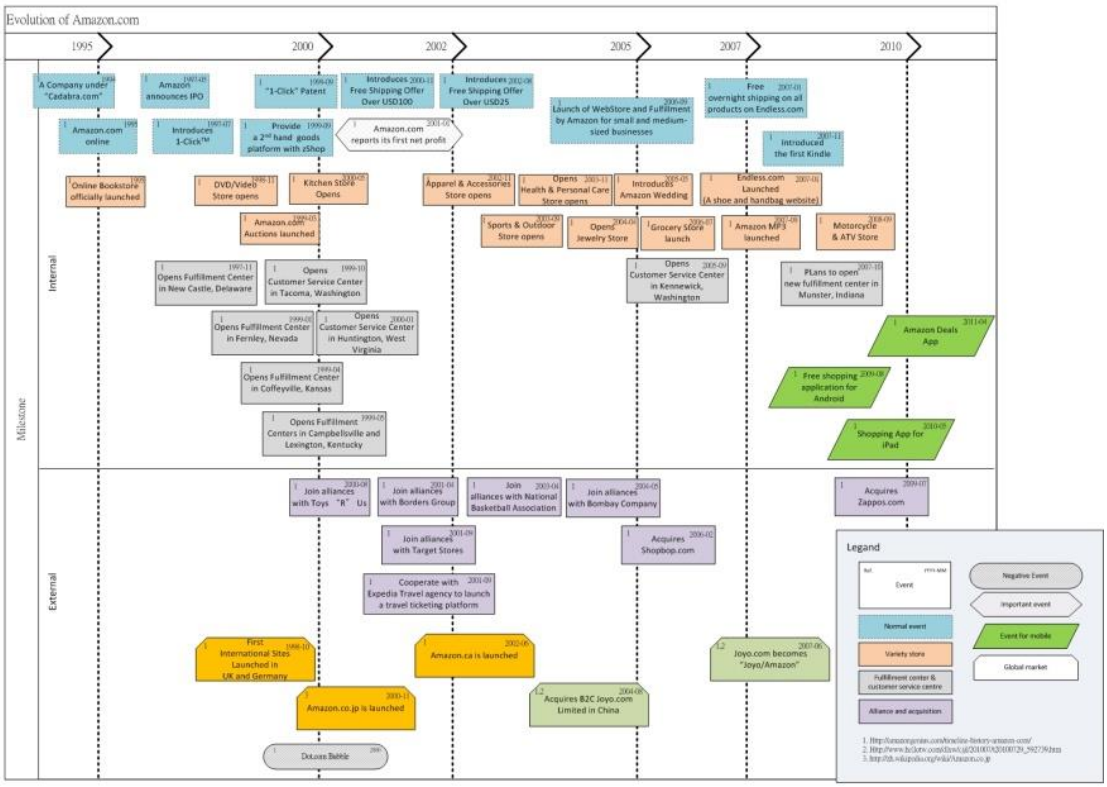


Figure 3 Example of Level 2 Roadmaps

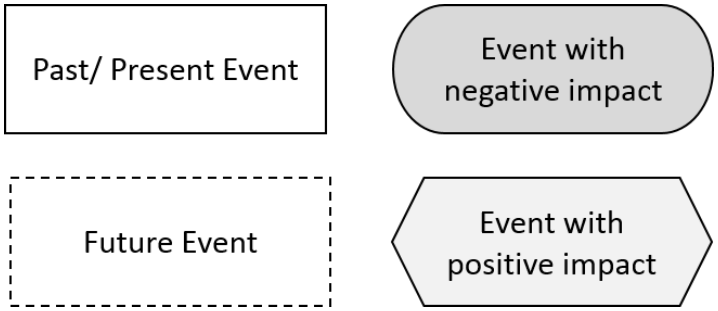
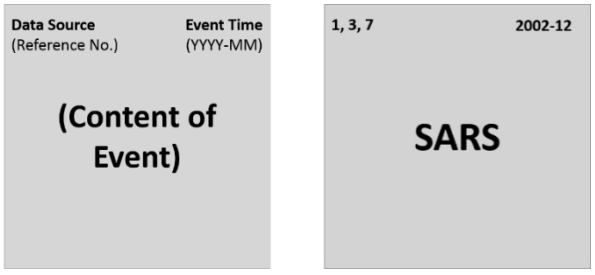


Figure 4 Four basic legends



(a) **(b)**

Figure 5 Textbox for Charting: (a) Format and (b) Example

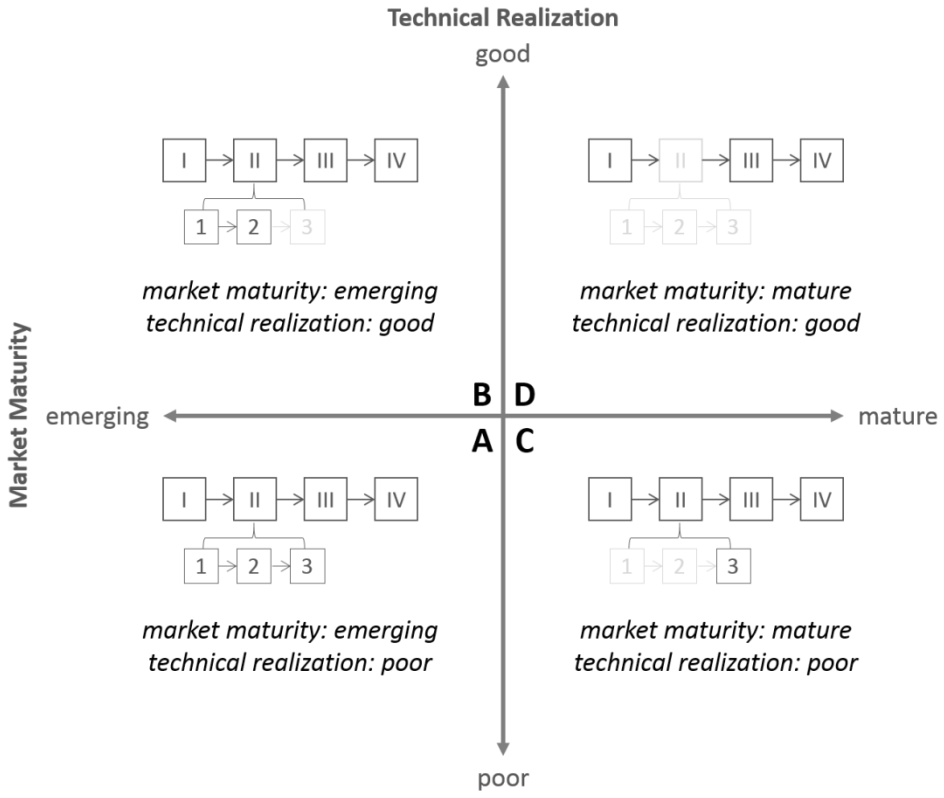


Figure 6 Suggested scenarios for customization of roadmapping in terms of market maturity and technical realization

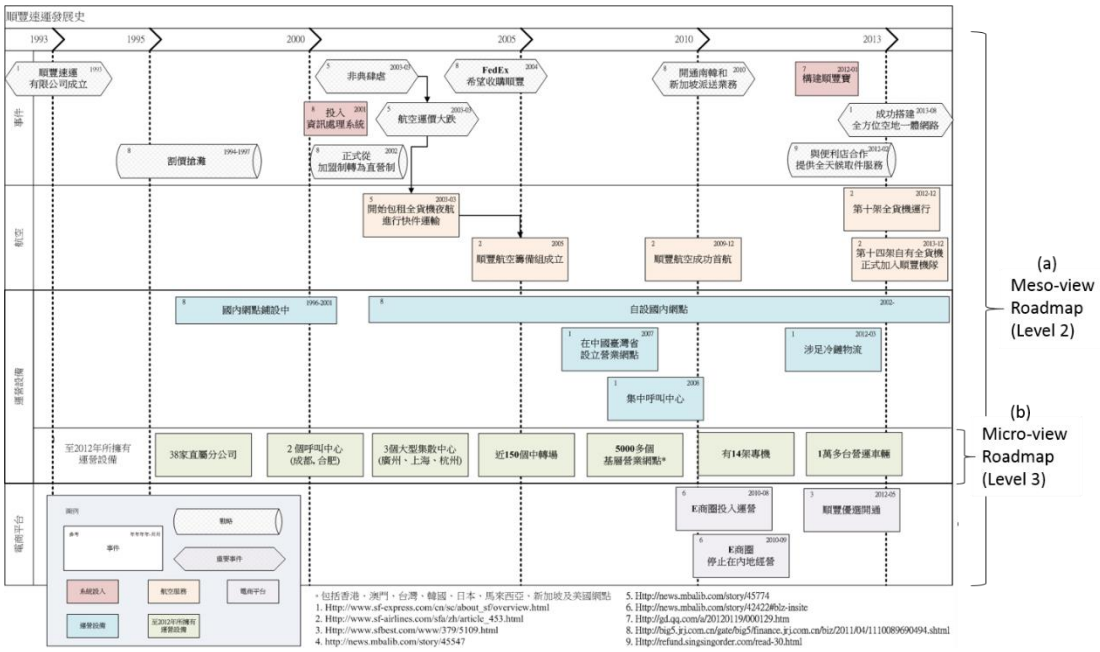


Figure 7 SF Express Roadmap - (a) Business Evolution (Meso-view) and (b) Business Operation (Micro-view)

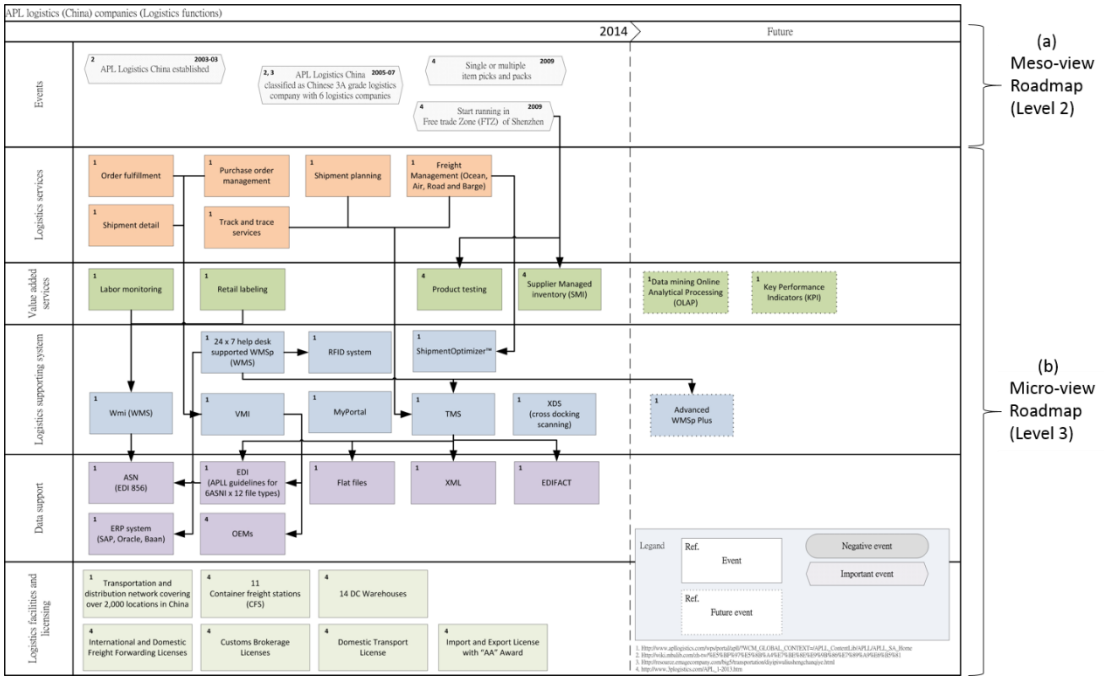


Figure 8 APL Roadmap - (a) Business Evolution (Meso-view) and (b) Business Operation (Micro-view)

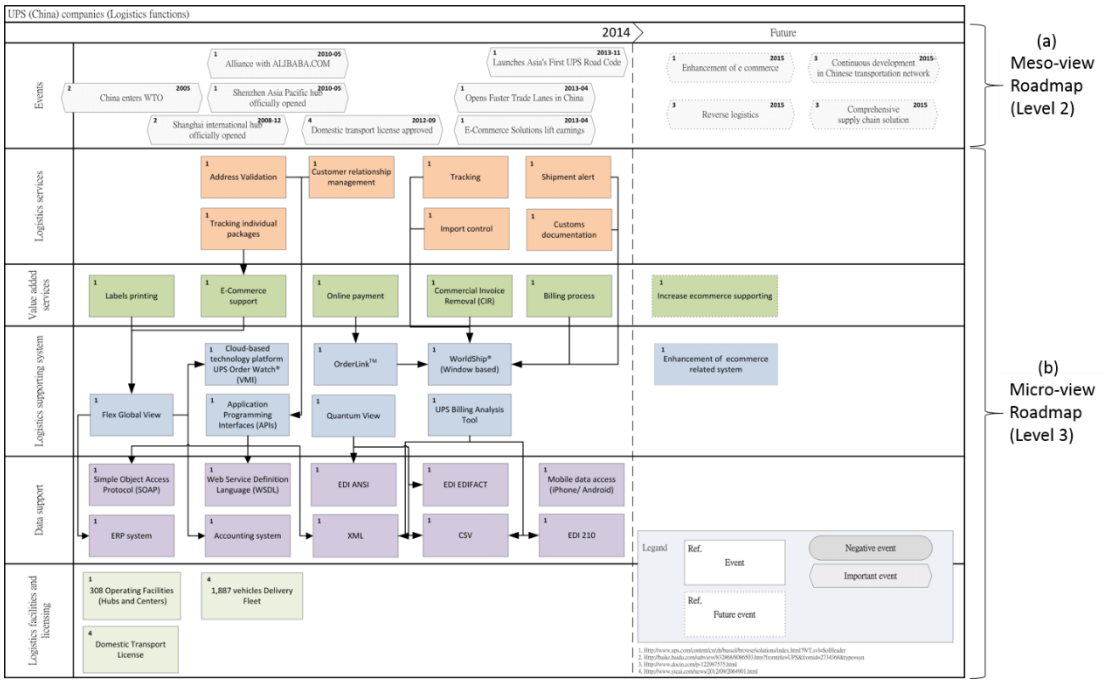


Figure 9 UPS Roadmap - (a) Business Evolution (Meso-view) and (b) Business Operation (Micro-view)

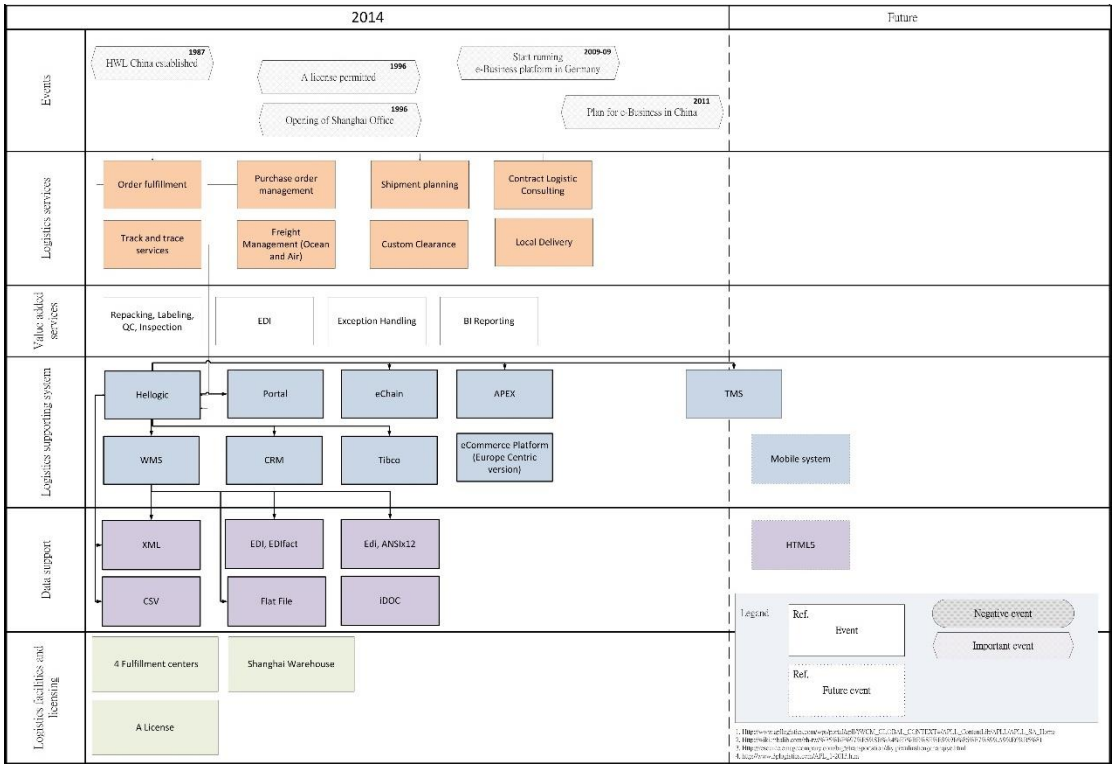


Figure 10 Inside-out Roadmap – Business Operation of Logistics Services of the Target Company

Table 1 Description of three-level outside-in roadmapping

Level	View	Focus	Unit of Analysis	Aims	Required Data
1	Macro	Ecosystem	Environment	• To provide a clear picture of the target market or technology as an ecosystem • To identify the stakeholders in the ecosystem	• Events relevant to the target market or technology as an ecosystem, including past events, present events, future events, and events with positive and negative impacts
2	Meso	Evolution	Individual	• To provide a	• Events relevant

			Stakeholder	better understanding of the selected stakeholders in the ecosystem	to the selected stakeholders in the ecosystem, including past events, present events, future events, and events with positive and negative impacts
3	Micro	Operation/ Function	Business/ Operation	• To provide a comprehensive study of the business or operation model of the selected stakeholder	• Detail of the business or operation model of the selected stakeholder in the ecosystem

Table 2 Suggested scenarios for customization of roadmapping in phase II

Scenario	Understanding of market or technology			Customized Outside-in Roadmapping
	Ecosystem	Evolution	Operation/ Function	
A	Poor	Poor	Poor	1 → 2 → 3
B	Good	Poor	Poor	2 → 3
C	Good	Good	Poor	3
D	Good	Good	Good	Optional

Table 3 Descriptions of Meso-view and Micro-view Roadmaps in a case study

Selected Company	**Meso-view (Level 2) Roadmap**	**Micro-view (Level 3) Roadmap**
SF Express	Business evolution in China (see Figure 7(a))	Logistics assets (see Figure 7(b))
UPS (China)	Business evolution in China (see Figure 8(a))	Business operation of logistics services in China (see Figure 8(b))
APL Logistics (China)	Business evolution in China (see Figure 9(a))	Business operation of logistics services in China (see Figure 9(b))

Table 4 Feedback form collected from the target company

1. The roadmaps provide rich information to support strategic planning.	Agree
2. The roadmaps let your company understand the current situation of the target market/technology.	Strongly agree
3. The roadmaps provide insights into future trends.	Agree
4. Recommendations based on the results of the roadmap are useful.	Agree
5. Your company will keep using this roadmapping method for strategic planning.	Agree