

The Influence of the Strategic Planning Approach on the Research Agenda of R&D Organizations

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Abstract Strategic planning in a research and development (R&D) organization requires a different approach in analyzing and designing research programs and projects, because of the specificity of its objectives and activities. Therefore, deploying a traditional business strategic planning approach might not meet all of the organizational goals. The objective of this paper is to demonstrate how the strategic portfolio analysis using simple tools can be used to translate the strategy and influence the research agenda of an R&D organization. Kuwait Institute for Scientific Research (KISR) has developed a general and simple portfolio model that can enable organizations, in particular, R&D organizations to develop manageable research agenda that meet the strategic objectives of the organization. KISR was used as a case study enterprise to demonstrate this phenomenon and accordingly develop a practical model.

Keywords Strategic planning · Portfolio analysis · R&D planning
R&D organization

Introduction

Innovation has been an important driver for competitive success in many industries, and it has shown high impact on society if managed strategically (Schilling 2012). The rapid technological change and the resulting new innovations has compelled organizations to improve their agility to be able to adapt to and take advantage of the new opportunities and minimize any threats. Therefore, success belongs to those organizations that have the capacity not only to adapt to change, but also to thrive on it (Morris et al. 2014). For R&D organizations, it is important to rethink the way they plan and manage their research activities considering the speed of

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technological and social changes. Therefore, improving the productivity of R&D organizations is becoming a challenge. This stems from two basic reasons as follows (1) the character of the organization and (2) the type of people involved in R&D (Jain et al. 2010). In the current knowledge and creative economy, effective management of R&D is crucial.

The strategic planning specialists and consultants are under further pressure in R&D organizations to focus their efforts toward meeting strategic objectives of current and future stakeholders. Therefore, corporations that rely heavily on R&D need an innovation strategy that favor an ‘incremental’ approach (Ansoff’s school of thought) as opposed to the common practice of ‘rational’ approach of Mintzberg (Tidd et al. 2013). The former approach can be more effective and consistent for a R&D organization which comfortably assumes imperfect knowledge of the environment and the future development. Hence, it is usually willing to change its strategy and even its approach to strategic planning in the light of development and changes that are frequently received and analyzed.

In R&D organizations, there is a bias toward allocation of resources to innovation activities. This sometime clashes with the business objectives of CEOs of corporates who want to acquire immediate profits, and the best way to do it. Therefore, there is a need to balance and manage innovation portfolio. According to Nagji and Tuff (2012), companies can outperform their peers if they optimize their innovation portfolio by allocating resources of about 70% to core initiatives (initiatives to make incremental changes to existing products and services), 20% to adjacent ones (initiatives that are aimed at leverage in another market something that the company does well today) and 10% to transformational ones (efforts designed to create new offers or a totally new business). This concept is very significant for independent R&D organizations and R&D functions within the corporation to keep up with the rapid pace of technological changes and to meet urgent client’s needs. Therefore, they need to build their own dynamic capability that can accommodate the paradigm shifts in R&D strategies. Although it is difficult to make continuous changes to the management processes in any organization; albeit, it has been proven necessary for the long-term success.

Strategic Planning at KISR

KISR is an independent national scientific research institute that was established in 1967. KISR’s initial role was dedicated to developing three fields of national importance; namely, petroleum, desert agriculture, and marine biology. Since then, KISR’s role and responsibilities have greatly expanded to include the advancement of national industry and the undertaking of studies to address key challenges, such as the preservation of the environment, sustainable management of Kuwait’s natural resources, responsible management of water and energy, and development of innovative methods of agriculture. Today, KISR consists of four research centers of about 580 researchers and engineers, over 100 laboratories, and three support

sectors housed at nine locations. KISR conducts scientific research and performs technological consultations for governmental and industrial clients in Kuwait.

At KISR, strategic planning has been one of the key functions that has been practiced since 1978 via formulation of a series of five-year strategic plans. Each of these five-year plans included a diversified set of goals that were oriented toward achieving KISR’s goals in solving Kuwait’s current and anticipated challenges. KISR completed a strategic transformation project in 2010 with the help of Arthur D. Little. The aim of this project was to transform KISR into R&D Center of Excellence focusing on innovation in support of the State of Kuwait. The project resulted in a new vision, mission, and a long-term strategy with a 2030 road map. The project also resulted in a new organizational structure and improved internal processes. Therefore, the first five-year strategy of KISR’s 2030 vision was the 7th strategic plan. In this strategic plan, the research agenda included a large number of proposed research activities due to the highly positive atmosphere after the transformation project and the high expectation of hiring new researchers in addition to the anticipated improved efficiency of optimized support processes.

KISR’s long-term strategy consisted of five strategic thrusts as shown in Fig. 1. These thrusts were designed to fulfill the new vision by focusing on client’s needs, collaborating with leading research institutions, building research centers in application-oriented areas, commercializing technologies, and building culture of achievement and excellence.

The 7th strategic plan made reasonable progress along the five strategic thrusts, by expanding stakeholder engagement, in particular, the clients, creating key account management process, signing various MoUs with international research institutes, investing in new research facilities, establishing a division for commercialization, and revising several high impact management processes such as publication and promotion policies. However, the general quantified achievement of the 7th strategy was not as expected based on the self-assessment and the strategy evaluation conducted by the strategic planning team at KISR which has also utilized

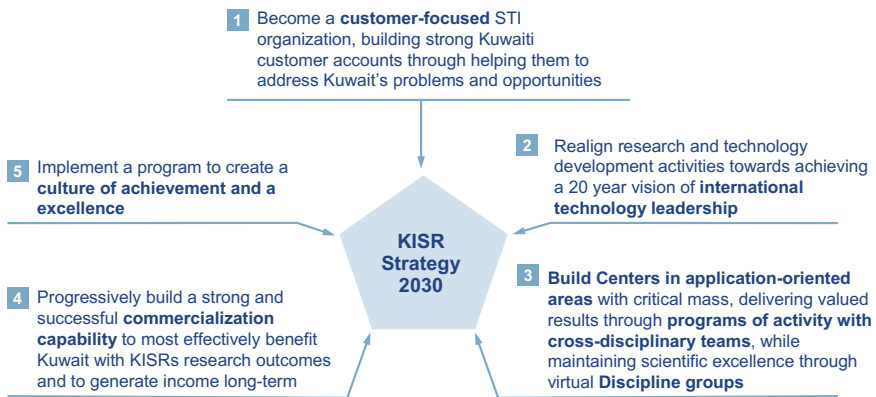


Fig. 1 KISR’s five strategic thrusts for 2030

stakeholder's feedback. The justification of the aforementioned was rationally necessary and can easily be documented with direct corrective actions such as the lack of manpower (mainly researchers), inefficient support services, and bureaucratic management processes. Nevertheless, the top management and the strategic planning team reacted by questioning the strategic planning approach and decided to amend it to overcome some of the aforementioned challenges and ensure that an effective process is in place.

Methodology

The significance of this work is to highlight the challenge that strategic planning faces in R&D organizations and how, if managed with flexibility, can be useful. This paper proposes practical solutions that can be helpful to practitioners in the field of strategic planning for R&D organizations. The methodology used in this research was empirical and explorative, since there is a need to describe and document the current situation and explain factors which together cause a certain phenomenon (Yin 2003). The aim was to understand how the strategic planning approach can influence the research agenda of an R&D organization. Qualitative data were mainly used through observation, interviews, group discussions and workshops to carry out the case study at the Institute in addition to the feedback workshops after completing the strategic planning activity.

The Need for a New Strategic Planning Approach

In addition to the aforementioned identified challenges related to the 7th strategic plan, KISR followed fairly standard strategic planning approach which included revisiting the vision and mission, conducting internal and external assessment, deriving strategic objectives cascaded at various levels (Research Centers/Support sectors, divisions, and programs/departments) and projects related to these objectives.

As to KISR 8th strategic plan (2016–2020), the approach was similar, but important amendments and new tools were utilized to address various challenges. These included the gap between the plan and the implementation which was due to lack of resources such as manpower, and in particular, experienced researchers; diversion from addressing client's specific needs; spreading too thin diverse and long list of planned research activities; and the slow internal processes such as procurement and recruitment.

Considering the aforementioned challenges, several corrective actions and strategic initiatives targeting support sector processes to optimize the key internal processes were identified in the internal assessment exercise as part of the strategic planning activity. However, the strategic planning team challenged the strategic

planning approach itself and decided to revisit it with the objective of addressing proactively the aforementioned issues.

It was agreed with the top management that the 8th strategic plan includes an honest and complete assessment of how we are doing and accordingly lay out a strategy for closing any gaps, including any modifications to KISR's portfolio of research programs. The strategic planning approach was designed to steer the research centers to focus their resources toward the commitment to a high level of confidence to meet the priority elements of their strategies, which meant making conscious decisions to stop supporting less important activities, while selecting a portfolio of activities across their research programs. This is to further secure innovative solutions to key clients in addition to considering the development of innovations that will have positive impact and positioning KISR for long-term success.

Moreover, specific steps for executing the proposed strategy were required to ensure more attention to the factors that may enable or disable the strategy, particularly with respect to process improvement within the sectors and capability development in every organizational unit. This perspective of considering the strategic planning process as a problem-solving strategy was adopted as a philosophy to resolve the current issues/challenges. As Rumelt (2011) stated, good strategy results in investing time to make hard choices to gain focus and identifying obstacles and working out how to deal with them.

The terminology that was introduced during the strategic planning process was important in addressing the challenges faced, such as using the term solution areas that each program is required to deliver. The 'solution' has given the message that the research should result in a tangible output and application to the client; although, it can be addressed by more than one research project or technical service ('area'). This was a deliberate approach for this specific stage for KISR to focus on meeting key client's needs. However, the key function within the strategic planning model is the portfolio evaluation matrix (PEM). PEM was introduced to influence the research agenda to become more client-focused, address the critical few, and most importantly, produce a balanced portfolio of research activities using a tool that can communicate visually the impact of the various solutions areas within each program and at the center level. As a result, the strategic areas at the center level can be identified, and hence, the contribution of each research program.

Aligning Scarce Resources to Serve the Strategy

Aligning resources spent on R&D activities with the strategic objectives of any organization has been one of the most challenging issues, in particular to technology-based firms. The strategic planning process ideally ensures that the list of R&D projects are proposed to serve the market and product strategies. The alignment, if it happens, is usually enforced by embedding it in the evaluation criteria. This alignment criterion is useful in the evaluation process, but will not

necessarily result in a balanced portfolio that meets the strategic objectives which could lead to different directions. For instance, there are objectives regarding growth in market share and profits, focusing on the cash cows projects, and others, looking at blue sky areas.

Decision making tools and in particular, R&D portfolio analysis available in the literature are not used widely due to the perceptions held by the R&D managers that the models are unnecessarily difficult to understand and use, and do not engage practitioners in a collective creative manner, especially when dealing with models like linear programming. Cooper et al. (1997) provided various practical and simple to use bubble chart tools including risk-reward matrix which had proven to be useful and practical. Part of these sets is the Impact-Effort Matrix that has been used in many contexts, including lean and six sigma (Bunce et al. 2008). The concept of this tool is powerful that can be used as part of the strategic planning process since it can be utilized to reflect the conceptual meaning of a strategy that addresses two key questions; “Where do you want to go” (i.e., the ‘Impact’ you want to achieve) and “How to get there” (i.e., the ‘Effort’ needed to ensure the ability to execute the strategy and deliver the required results, which was the main challenge at KISR). However, these need to be translated to each organization as per their context, definitions, their mission and strategic objectives.

The generic matrix that we developed is based on the aforementioned concept, but we used the terms impact and ability. This generic framework can be used to translate any strategy to a visual and practical decision-aiding tool. The impact would reflect the expected contribution of the R&D programs and projects on the predefined strategic objectives of the organization, and these can be grouped based on the desirable portfolio shape of the organization to produce a balanced portfolio of activities.

The Portfolio Evaluation Matrix (PEM)

One of the important lessons learned from the execution of the 7th strategic plan was the number and magnitude of the projects proposed by the programs which far exceeded the organization’s ability to support in terms of manpower, facilities, equipment, and administration. To correct this problem, the 8th strategic plan needed to focus on KISR’s limited resources on those initiatives that will have the largest impact on meeting national challenges; client’s mission critical problems; and KISR’s reputation and financial commitments. Each center followed a sequential process to evaluate its existing research programs, determine which programs would be continued, added, or modified within the 8th strategic plan, and to identify the specific solution areas that would form the heart of the centers research activities over the next five years. This process is briefly described in Fig. 2 which shows the main features of the process. PEM is a critical function in the process which serves the three important objectives as follows:

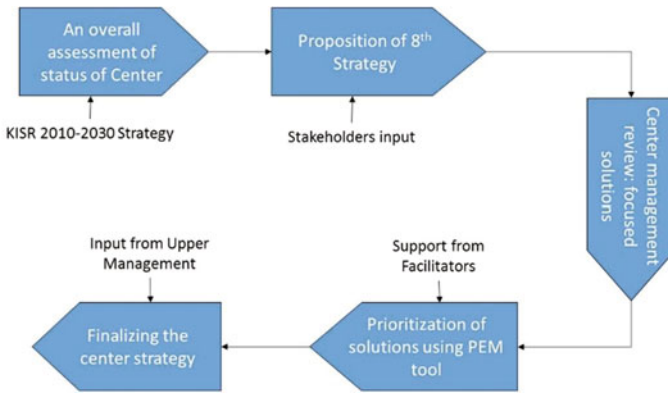


Fig. 2 Process overview for the development of the center research agenda

- To critically evaluate each of the programs and solution areas
- To help in making decisions with regard to aligning and directing programs toward the overall center strategy
- Select those program solution areas that the center will emphasize and give the highest priority.

The PEM was designed to help the center management in evaluating the solution areas that were proposed in the program strategies. The two-dimensional matrix as shown in Fig. 3 consists of two major criteria, the potential impact that the solution area may have in the next five years and the ability of the current program team to deliver what is being promised. Using this preliminary ranking as a guide, the center management can then make judgment decisions on program/solution area priorities within the center.

The codes used in the chart denote the program and solution area (e.g., P2A1 is the first solution area in research program 2) and the size of the bubble is the anticipated revenue stream from technical services/projects. The specific data about the solution areas within each program are not shown due confidentiality issue.

To calculate the potential impact of each solution area, three criteria with specific weight for each were used to evaluate each solution area. These criteria were derived from KISR’s five strategic thrusts of the 2030 strategy. Each solution area is scored 1–10 scale points, as per the detailed definition of each criteria where 10 is the highest value.

- **The anticipated impact in meeting a national challenge**—Solution areas directly related to finding solutions for national challenges and expected to make high impact.
- **The anticipated revenue stream from technical services/projects and commercialization of IP**—Commercialization is broadly interpreted to include spinouts, IP income (patents, copyrights, license), and technology transfers.

- **Enhancement of KISR’s regional/International reputation**—Outputs to be considered for evaluation include high impact publications, joint publications/activities with international partners, and regional STI leadership initiatives such as the Regional Persistent Organic Pollutants laboratory, patents, and attracting senior hires with an international reputation.

Likewise, to calculate the ability to deliver results, three criteria were used to evaluate each solution area using 1–10 scale point, as per the detailed definition of each criteria where 10 is the highest value.

- **Strength of the program leadership**—The talent, experience, motivation, and track record of the program manager and the identification of an adequate backup
- **Quality and depth of the program staff**—The availability of adequate professional and technician support for program execution
- **Adequate facilities**—The appropriateness of the current facilities, approved facilities and currently under construction.

The output of this process is not an overall score, i.e., a weighted average of the scores for impact and ability to implement, rather a matrix using bubble diagram function that was customized in an Excel-based program using VBA tool which shows four quadrants that can be addressed using different strategies.

- **High impact—High ability:** These are the expected winners where the anticipated impact is almost certain; hence, the center’s image will rely on them and it will be a star, if expected revenues are high (e.g., P2A3, P2A1, P4A5 in Fig. 3).

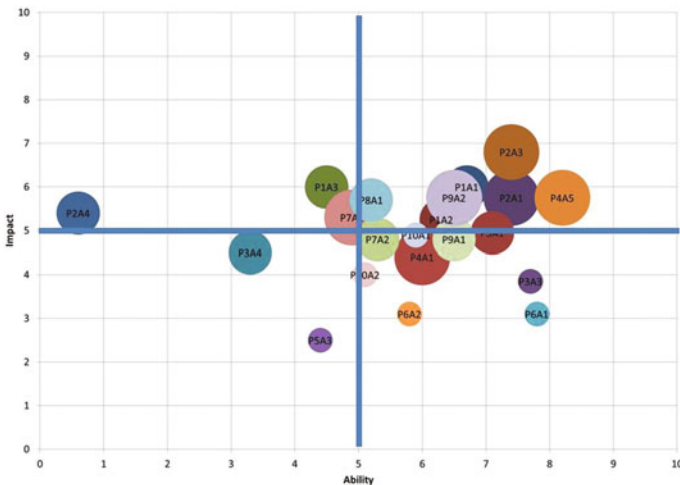


Fig. 3 Portfolio evaluation matrix (real example from one of the research center)

- **High impact—Low ability:** The solution areas here need special attention by the management and rigorous assessment to all the factors need to be addressed with urgency. These include recruitment, procurement, partnerships, consultants, etc. (e.g., P2A4 in Fig. 3).
- **Low impact—High ability:** The solution areas that fall here should be the ones that the center depends on in generating revenues, expanding its market, unless the expected revenues are not high (i.e., the size of the bubble) then a possible strategy is to divert resources to other solution areas where applicable or even use retraining strategies to enter new research area (e.g., P6A2, P6A1 in Fig. 3).
- **Low impact—Low ability:** The solution areas are not desirable here, and they should not be pursued. Therefore, it is important to revisit and reassess these solution areas and possibly abandon them at the planning stage and reallocate planned resources (e.g., P5A3 in Fig. 3).

The results of the overall ranking of the research center's solution areas are not the end of the process; further review and analysis and iterations to ensure that a balanced portfolio of research activities are maintained. This process has eventually helped the institute to focus on the critical few areas; and therefore, it has developed a much shorter list of key projects within each research program structure that satisfies the multiple goals of the institute. This has been a very useful approach from a management perspective.

However, the feedback was not received with the same motivation from the staff and research program managers, since they are usually excited and motivated to conduct a large number of research ideas based primarily on their interest, rather than on its alignment to the organization's strategy. Therefore, they found it for some time difficult to accept the portfolio result and especially if it redirects or undervalues their perspective on the program contribution when compared with other research activities. This challenge was overcome in the limited cases where the management of the involved research centers, at early stages, the research program managers, and in some occasion, the senior staff. Moreover, it is designed to make the process as transparent as possible, in addition to providing enough window for feedback and discussion.

Conclusion

This paper has demonstrated the motive to use the strategic planning approach to influence the research agenda of an R&D organization. The design of the strategic planning approach including the necessity to introduce new tools such as the PEM has helped significantly the research centers to focus their effort and energy on a manageable and balanced portfolio of research activity that meets the strategic objectives of the organization according to its long-term road map. The final research strategy addressed the identified gaps and issues of the centers resources being spread too thin and too broad to be effective in all areas. Moreover, the

strategic planning approach influenced the research agenda to include a mix of research activities that can, in totality meet the key performance indicators associated with the five strategic thrust of KISR's 2030 strategy effectively. These conclusions were documented based on the feedback that was captured from various interactive workshops with all the management of the research centers. The main lesson learned from this exercise showed that a standard and a rigid strategic planning process will not serve a research organization which evolves naturally and continuously due to the dynamic external conditions. Therefore, adopting an agile approach and introducing innovative management tools within the strategic planning approach are important to enhance the performance of the strategic planning of any research organization. Moreover, considering the workshop feedback on the 8th strategic plan approach, a further modified approach will be considered with the aim to address the important issue of producing a truly integrated institute strategy and reflecting an optimized research portfolio at the institute's level.

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