Analysis for Developing a Clearing House of Nuclear Technology using SWOT-BSC Strategies

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Abstract. Nuclear R&D products are not fully accepted in the market, one of the reasons is the lack of safety assurance. BATAN has established the CHNT to conduct clearing of nuclear R&D products. However, currently the CHNT has no adequate working programs and improvement patterns. To analyse those weaknesses, a SWOT survey were conducted towards employees and took a case study of HTGR technology. The analysis result was a set of activity strategies which then be prioritized and selected based on BSC perspectives, to determine logical strategy sequence, targets and activities. SWOT strategies were expressed by combination of WO-WT-SO-ST, to overcome weaknesses and capture opportunities in improving the CHNT. All BSC perspectives were applied to explore those combination and select the best steps for the CHNT. By means of this SWOT-BSC strategy analysis, an effective development formulation for the CHNT is proposed in the form of two phase project for two years duration to support EPR program in Indonesia.

Keywords: strategy, analysis, SWOT, HTGR, Clearing House, perspective, BSC, survey

1. Introduction
Nuclear technology research and development (R&D) at BATAN is not supported yet by R&D management system from basic to applied researches. One of the loose links in R&D is the commercialization or downstreaming of the nuclear R&D products, whereby the products are not popular for the public, or even resistant because of the nuclear stigma. To close the gap of the downstreaming, it is necessary to set up an organization that may provide safety assurance of nuclear products and radiation protection to the public, industry and environment in Indonesia in accordance with standardization principles[1].

BATAN Chief Regulation (CR) no 11 / 2017 is issued to establish the Clearing House of Nuclear Technology (CHNT)[2]. It aims to provide safety assurance and environmental protection by means of assessment or clearing on the utilization of nuclear R&D products for public[3]. The tasks of CHNT, among others, are to issue certification of products, processes, services, systems, technologies and personnel, and to provide recommendation on nuclear products and technologies. At this early stage, human resources (HR), equipment, or business management are not adequately allocated. As the principal organization, Center for Nuclear Standardization and Quality (CNSQ) has to supply those needs in a sufficient number and quality.

However, those requirements cannot be fulfilled at once by CNSQ, hence step-by-step and effective action plans, strategic steps, and institutional development programs for CHNT are necessary. Early stage of CHNT business planning requires a systematic approach by
means of business development methods acceptable by all stakeholders. Several well-known methods are, for example, Strength-Weakness-Opportunity-Threat (SWOT) analysis, business canvas model, cause-effect analysis, enterprise architecture model, and Balanced Scorecard (BSC). Each method has its advantages and limitations. Recently, the combination of business planning methods are becoming popular, for each method can fulfil limitations and benefit from advantages of the other method in the analysis and business process planning of the organization[4].

This article explores the application of a current business development model for the operation of CHNT, to acquire organization capabilities in conducting nuclear technology assessments, especially new technologies from other countries, and specifically to provide for CHNT in issuing safety assurances and recommendations towards systems, structures and components of High Temperature Gas-cooled Reactor (HTGR) to be built in Indonesia.

2. Methodology
This article describes the implementation of SWOT analysis combined with BSC perspective approach in formulating business process planning for CHNT, to compile an optimal business map. SWOT analysis starts with identifying and collecting data for each element in SWOT of the organization. SWOT data collection is conducted by distributing a questionnaire form to be filled in by 20 employees. Each employee is asked to write down 3-5 items for each element on Strength (S), Weakness (W), Opportunity (O), and Threat (T) of the CNSQ. Furthermore, SWOT data is also acquired by a document review of BATAN Strategic Planning 2015-2019[5]. The collected data is then categorized and the top 3 topics are then selected for each element resulting in the total of 12 topics to be analysed. Each topic is coded as S1-S3, W1-W3, O1-O3, and T1-T3, respectively.

Strategy definitions from SWOT analysis are combinations of SxOx, WxOx, SxTx, and WxTx, even though not all topics may be logically combined for its content and nature. The combination of SO is often described as expansion strategy (use available strengths to capture opportunities), combination of ST as diversification strategy (use its strengths to avoid threats), combination of WO as stabilization strategy (use opportunities to overcome weaknesses), and combination of WT as defensive strategy (improve weaknesses to avoid threats). Finally, there are 36 strategies in total, which then need to be selected and implemented gradually to develop CHNT tasks.

Not all strategies may be implemented, and not all strategies may be performed at once. Hence, to develop a logical strategy sequences, it is necessary to implement Balanced Scorecard (BSC) method. The BSC method consists of 4 (four) perspectives, i.e. learning and growth perspective, business process perspective, customer perspective, and financial perspective. For government institutions, the last perspective may be modified to public image perspective or long term perspective.

In this article, WO and WT strategies correlate with learning and growth perspective since they change weaknesses into new strengths (see Figure 1). These new strengths are then applied to SO and ST strategies to become business process perspective. The last step is to drive all these strengths to capture various opportunities (SxOx).

In the initial strategies for learning and growth perspective, only few weaknesses could be improved, and only some strengths could be applied to gain simple opportunities. This is Phase 1 that will take one year at the most to be accomplished. Meanwhile, Phase 2 is the period to overcome other weaknesses and to exploit any other opportunities (see Figure 1).
3. Results and Discussion
3.1. Questionnaire Results
As a result of SWOT questionnaire for existing CHNT on its internal and external conditions, there are selected topics on SWOT elements, as follows:

a. Strengths (Internal)
- Has several accredited testing laboratories on specific scopes
- Has competence employees on specific areas
- Has adequate nuclear facilities and installations
- Has good and approved management systems and administrations

b. Weaknesses (Internal)
- Laboratory and facility equipments are at aging conditions
- Cooperation between centers are weak
- Lack of competence, especially on younger employees
- Acquired scientific methods and experiences are not yet standardized
- Nuclear R&D product database are inadequate

c. Opportunities (External)
- There exists national regulations and international agreements which support CHNT activities
- More products, services, processes, technologies, and personnel in nuclear technology from other countries coming into Indonesia market
- National and international cooperation are available for developing activities, human resources, as well as facilities / infrastructures

d. Threats (External)
- Negative public stigma towards nuclear technology
- Domestic nuclear industry is underdeveloped
Lack of public acceptance for the CHNT existence

From these topics, a CHNT development program was formulated using SWOT strategy analysis, with the combination of SWOT elements. These strategies include efforts to maximizing strengths, overcoming weaknesses to become strengths, exploiting opportunities and avoiding threats, as well as changing threats into opportunities.

The analysis has resulted in several strategies that need to be converted into CHNT activity map on specific periods to develop the CHNT into more strong, effective and efficient organization and activities. In general, there are two types of strategies, which are internal improvement project and expansion project. Furthermore, the CHNT development may be separated into two phases in a specific period of time.

3.2. Internal Improvement Project (Phase 1)
This phase of internal improvement includes strategies to overcome CHNT weaknesses by exploiting external opportunities, which need to be converted into programs and actions. In this phase, the focus are capacity building and internal method or process standardization. These strategies include:
- Standardize testing methods or R&D products as benchmarks against foreign products, services, processes, and technologies that will get into domestic markets;
- Conduct coaching-mentoring for CHNT personnel to familiarize the CHNT business processes;
- Identify products, services, processes, system and technology available in BATAN and also from foreign origin to build databases;
- Develop CHNT activities which engage centers in BATAN for cooperation; and
- Prioritize activities which are self-reliance and need minimum facilities, but will have significant impacts on public.

This phase 1 requires a period of approximately one year, during which all outputs and processes are always monitored and evaluated. The evaluation is required to ensure that weaknesses and limitations have successfully overcome and become new strengths to be exploited in the next phase strategies.

3.3. Expansion Project (Phase 2)
The phase of expansion is a subsequent period after conducting CHNT internal condition improvement. The developed strengths will become new topics in SWOT analysis to be exploited in capturing opportunities as well as avoiding threats, and also for fulfilling public expectations. These strategies include:
- Sign agreements with external testing laboratories to expand scopes of activity;
- Revitalize BATAN R&D facilities to be aligned with CHNT business focuses;
- Make use of CHNT activities for human resource development and improvement of competences;
- Strengthening the CHNT cooperation and networks as a nuclear technology center of excellence;
- Conduct public expose and promotion to public at all levels to improve nuclear product image that they are safe and secure;
- Strengthen databases as well as national and international networks starting with BATAN MIS to publish CHNT outputs and become nuclear technology center of excellence; and
- Harmonize regulations on nuclear product and technology utilization with the involvement of domestic nuclear industries and other stakeholders, including the regulation on Non-Tax State Revenue tariffs.

The Phase 2 requires one to two years period of implementation, with an option to improve continuously.
The gradual development of CHNT in accordance with the organizational conditions will ensure optimization budgets while achieving expected results. By implementing the projects, at the same time disadvantages and weak elements in BATAN may be well improved and strengthened.

Figure 2. Result of CHNT Analysis using SWOT-BSC Method

3.4. CHNT Roles in EPR Design and Operation Program

The proposed CHNT development program as described in the previous paragraphs, is expected to improve organizational capacity to conduct clearing for certification and recommendation purposes of various nuclear products and technologies to be applied in Indonesia, including generation IV Nuclear Power Plant (NPP) technology such as High Temperature Gas-cooled Reactor (HTGR). Currently, BATAN is preparing Experimental Power Reactor (EPR) design based on the HTGR technology[6]. The phase 1 - internal improvement of CHNT as described previously, when actually applied to EPR assessments or any other new reactor technologies, requires CHNT to:
- Standardize assessment methods for NPP design to be applied as safety criteria;
- Train its personnel to be competent in HTGR technology design and competent in assessment of design safety, in accordance with established national certification system;
- Compile databases of existing and new systems, structures and components (SSC) of EPR utilizing available BATAN MIS; and
- Conduct assessment or clearing of specific EPR components and publish the result to relevant stakeholders.

IAEA specific safety requirements on NPP design to be applied in HTGR technology defines 82 requirements, that are divided into 4 groups, i.e. safety management in design, principal technical requirements, general plant design, and specific plant systems design. However, the document does not address nuclear security, accounting system and control of nuclear material, and conventional industrial safety. Although this document is applicable to land based NPP with water cooled reactor, other new reactor types, with judgment, may also be applicable [7], with addition of grading approach requirements. Therefore, it is the best approach if the CHNT compiles the guide or assessment criteria of EPR design in accordance with this IAEA document, and also the IAEA requirements for research reactor safety[8], in addition to BAPETEN regulations[9].
As a new technology, the NPP needs to have personnel with newest competence based on three aspects, which are knowledge, skill, and attitude. EPR design team members have already acquired some competences in this field, and need to be supported by a national certification system (SKKNI)[10]. CHNT through the above mentioned development can achieve this objective, by conducting personnel competence certification that is accepted nationally and internationally. Internally, CHNT also need to develop assessment competence for safety technology of HTGR, to be able to conduct the clearing activity, whether for systems, structures or components, or for the overall HTGR technology. The CHNT personnel will have the competence of design safety requirements of HTGR and in general industrial safety requirements.

In deploying HTGR to be operational in Indonesia, there will be many entities, consortia and organizations involved. To ensure organization capability in managing every process of HTGR deployment, it is required that integrated management system be implemented at all stages[11]. For assessing the fulfilment of the requirement, CHNT will develop a certification scheme for quality management system, environment management system, occupational health and safety management system, and security management system[3].

By implementing the overall business development strategic planning of the CHNT as described, sequentially and continuously, it is believed that CHNT will be able to contribute in supporting the successful achievement of EPR Blueprint, along the deployment steps from EPR planning, construction, and operation in Indonesia[12].

4. Conclusion and Recommendation

BATAN has established the Clearing House of Nuclear Technology (CHNT) with the task to conduct clearing and thus providing safety assurance to nuclear R&D products, however it still need further improvements. An analysis method by combining SWOT and BSC has been conducted, resulting in a set of strategies for CHNT improvement. Those strategies need to be logically arranged and prioritized.

The development program for CHNT consists of two phases projects for two years, with the priority to improve internal condition and to expand business afterward, while maintaining budget efficiency. Through this program, the CHNT will raise new internal strengths and hence will improve BATAN image at the public, in conducting clearings for a various systems, structures, and components of the EPR installation. This way, the CHNT will become a center of excellence, especially for HTGR technology in Indonesia, and also specifically will support EPR design project.

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References

[1]. Republic of Indonesia, Law no 20 / 2014 on Standardization and Compliance Assessment, Jakarta, 2014.

[2]. BATAN, Chief Regulation no 11 / 2017 on Clearing House of Nuclear Technology, Jakarta, 2017.

[3]. Ngarayana, "Clearing House Teknologi Nuklir Berbasis Standardisasi: Studi Kasus pada Asesmen Teknologi Reaktor Nuklir Generasi IV," in Prosiding Seminar Nasional Teknologi Energi Nuklir, Batam, 2017.

[4]. F. Rangkuti, SWOT Balanced Scorecard, Jakarta: Gramedia, 2015.

[5]. BATAN, BATAN Strategic Planning 2015-2019, Jakarta, 2015.
[6]. W. N. News, "Progress with Indonesian SMR Project," World Nuclear News, 16 March 2018. [Online]. Available: http://www.world-nuclear-news.org/NN-Progress-in-Indonesian-SMR-project-1603184.html. [Accessed 28 April 2018].

[7]. IAEA, IAEA Specific Safety Requirements - Safety of Nuclear Power Plants: Design, SSR-2/1 (Rev.1), Vienna, 2016.

[8]. IAEA, IAEA Specific Safety Requirements - Safety of Research Reactors SSR-3, Vienna: IAEA, 2016.

[9]. BAPETEN, Chief Regulation no 3 / 2011 on Safety Requirements of Power Reactor Design, BAPETEN, 2011.

[10]. B. Siradjuddin, "Sistem Pengembangan Sertifikasi Kompetensi Kerja SDM Indonesia," in Prosiding Seminar Nasional SDM Teknologi Nuklir, Yogyakarta, 2016.

[11]. A. B. Purnomo, "Sistem Manajemen dalam Persiapan Pembangunan Reaktor Daya Eksperimental: Tantangan dan Peningkatan," in Prosiding Seminar Nasional Teknologi Energi Nuklir, Batam, 2016.

[12]. T. Taryo, "The On-going Progress of Indonesia's Experimental Power Reactor 10 MW and Its National Research Activities," in Prosiding Seminar Nasional Teknologi Energi Nuklir, Makassar, 2017.