

ar methods. They identified the features of the distribution of uranium and thorium on the territory of our country, which later allowed us to organize their industrial production. Further studies of radioactivity were also carried out in Leningrad (A. F. Ioffe, I. V. Kurchatov, G. A. Gamov, etc.) and Kharkiv (A. M. Leipunsky, K. Sinelnikov, and A. V. khamov). Walter, L. Landau, and others) at physics and engineering institutes. [1] So, by the middle of the 19th century, the theory of the atom was basically built. [1,3,4]

Conclusion

At the end of the nineteenth century, while Becquerel was involved in a somewhat well-known luminous process at the time, it suddenly encountered a completely new phenomenon - radioactivity. She gave the researcher a gift, allowing him to look at the new, unexplored world of subatomic physics. Researchers who worked in this field in the 20th century discovered a completely different world, with its own laws, even different from the world's standard described by classical physics.

REFERENCE

1. Abramov A. I. history of nuclear physics. Moscow: Energoatomizdat,1983. 256 p.
2. Doroshchuk V. E. Nuclear reactors at power plants. 1977. 207c.
3. Levin V. E. Nuclear physics and nuclear reactors. Moscow: Atomizdat,1979. 287 p
4. Collier John., Hewitt J. Introduction to nuclear power. Moscow: Energoatomizdat, 1989, 255 p.

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PROFESSIONAL CAREER DEVELOPMENT OF SECURITY KNOWLEDGE IN THE NUCLEAR INDUSTRY

Abstract

A research on the Professional Career Development of Security Knowledge in the Nuclear Industry has been done. This was done by considering the motivational key factors that contribute to the establishment of the

nuclear security support elements of an organisation in the nuclear industry. The consideration of the key factors was carried out through three (3) major pathways, namely: assessment under the state's nuclear and radiological security regime, development of an Integrated Nuclear Security Support Plan (INSSP), and International cooperation. The expectant results are to be quantified qualitatively with the aid of Key Performance Indicators (KPI's). The two main motivating factors which are: finance growth focussed and customer service growth focussed are considered in the results discussion. The KPI's provide objective evidence of progress towards achieving the desired result. It is expected that the KPI's will be used to measure what is required to confidently inform a better state level decision making and a research tool that gauges the degree of performance change over a period of service delivery in the nuclear industry.

Introduction

Many professionals in the nuclear industry for a long period, have given safety considerations a high priority by providing sufficient resources, and kept security infrastructure requirements under-resourced. This had often been the perception for the reason being that, there has been no or less security incidents which had negligible impact on the routine activities or estimated profit margin of the organisation [1]. This research was carried out to assess the strategic establishment of an organisation (i.e. its mission), and also how it operates or maintains its vision to yield the expected output (i.e. profit). Professional Career Development is a systematic process of self-assessment or institutional study on career exploration, planning (i.e. goal setting) and follow-through activities with preliminary employment strategies [2]. Current knowledge recognises that, though the responsibility of cooperate management in securing any organisation that uses or stores radioactive or nuclear material, may not be directly linked with nuclear security, there is yet the liability to ensure that these materials are secured and used only for the purpose for which they were procured. The various departments with responsibility for security in the nuclear industry have been analysed to include but not limited to: Legal and regulatory affairs, Finance and insurance, Procurement and supply chain, Risk management, Engineering and Design, Operations and maintenance, Safety and Environment, Human Resources, Information Technology, Sales and marketing, Corporate communications and Administration. The World Institute for Nuclear Security (WINS) is, as at now the only accredited body that is leading in the professional development and certification for nuclear security management. WINS advocates that all nuclear and other radiological materials and facilities are effectively secured by demonstrably competent professionals applying best practice to achieve operational excel-

lence [3]. The knowledge accrued on securing any organisation has been found to interact with, and also support the goals of that organisation's establishment and the specific objectives for its activities. There is the assurance of Job creation and Job maintenance which leads to an establishment of an acceptable standard of Professional Career Development.

Materials and methods

The path ways of career development for stakeholders concerned with nuclear security in the nuclear industry according to this research, are assessed in three (3) main categories:

- Assessment under the state's nuclear and radiological security regime.
- Development of an Integrated Nuclear Security Support Plan (INSSP).
- International cooperation.

Assessment under the state's nuclear and radiological security regime

The major factors usually considered under the state's nuclear and radiological security regime include: International legislative documents, the adoption of emergency measures, National management plans, Detecting and responding of illegal traffic, Control and accounting, Physical Protection and information security [4].

Development of an Integrated Nuclear Security Support Plan (INSSP)

This is a classified document that is prepared to consolidate the nuclear security needs of an individual state and includes the necessary nuclear security improvements, based on the IAEA's Nuclear Security Series documents. It provides a customized framework for coordinating and implementing nuclear security activities conducted by the state concerned, the IAEA and potential partners. The structure of the INSSP adopts a comprehensive nuclear security approach which has components of preventative, detection and response measures, all guided by a regulatory framework derived from international legal instruments, to avert threat and radiological events. The professional career development of the human resource is employed to establish a sustainability component of an organisations.

International cooperation

The International Atomic Energy Agency (IAEA) has supported a lot of countries, especially its member states, through technical meetings, workshops, conferences and internships to share knowledge and infrastructure that has immensely contributed to the professional career development of personnel stakeholders who are involved in the peaceful uses of applicable technologies in the nuclear industry. International cooperation modalities are insti-

tuted to control adversarial activities to create/secure jobs and enhance productivity.

Results and discussion

The resultant of the effective strategies implemented in establishing a standardized professional career development system is often referred to as Key Performance Indicators (KPI's). KPI's are measurable outcomes tied to specific tasks listed by the job description [5]. Acceptable KPI's provide objective evidence of progress towards achieving a desired result. They are also used to measure what is required to confidently inform a better decision making and a research tool that gauges the degree of performance change over a period. In attaining the best results, organisations in the nuclear industry adopt KPI's at multiple levels to evaluate their success at reaching targets. A high level KPI may focus on the overall performance of the operating nuclear facility, while a low-level KPI may focus on standard operating procedures (SOP's) for sales, marketing, human resource and health, safety and environment (HSE) departments [6].

There are two (2) main motivating factors that encourage the establishment of performance indicator models. These are: a) Financial growth focussed: revenue growth rate, net profit, return on investment and profitability over time, and b) Customer growth focussed: service demand intensity and client retention rate [7]. The major stakeholders of an organisation or system who exhibit these indicators are made up of the Board of Governors, Executive Management and Personnel workers at supervised and controlled areas at the nuclear facility. These stakeholders exhibit specific indicators such as career growth or provision of progressive ways along the career path, provision of meaningful work visible by its impact, attainment of a functional wage, availability of learning/training opportunities, work satisfaction and ease of application in other occupational sectors [8]. An assessment of a state's KPI of nuclear security in the nuclear industry can be very complex and requires detailed data from the three (3) main categories listed in the methodology: Assessment under the state's nuclear and radiological security regime, Development of an Integrated Nuclear Security Support Plan (INSSP), and International cooperation. An accurate KPI deduction of a hypothetical state nuclear infrastructure in accordance with nuclear security requirements is still under research. Some of the contributing factors for calculation are:

- A count of the number of nuclear organisations and workers at these organisations who are satisfied, review the incident and accident occurrence, and consider the type of service provided.
- A percentage of the number of nuclear organisations and workers that are providing the needed service in the energy, health, agriculture and

other industrial applications as compared to other resources (i.e. renewal and non-renewal).

- The Sums of major achievements across the total time spent working hours and the total service revenue documented.
- Averages of the service recipient satisfaction, days lost due to injuries per employee and average service revenue per service demand.
- Ratios are applied to the total of the service revenue accrued divided by total services revenue accounted for by invoice in the records. And also, total service revenue divided by total hours spent on services that generated that revenue [5].

For the practical implementation of the professional career development scheme, Hackett et. al. found eight (8) areas important for successful career development: communication skills, interpersonal skills, political skills, organisational skills, general-career planning and management skills, career-advancement skills, job-specific skills and adaptive cognitive [9].

Conclusion

Professional Career Development (PCD) forms part of effective organisational strategy in accomplishing the mission of any nuclear technology-oriented organisation. Equipping the prevention, detection and response teams through realistic Key Performance Indicators (KPI's) is inevitably a requirement for the financial and customer growth of the nuclear industry. This research has provided the needed contributing factors and computational mechanism to qualitatively quantify the level of indicator success of the professional career development of the personnel and other major stakeholders in the nuclear industry.

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REFERENCES

1. Babcock Nuclear / DECC / IAEA Workshop (2013, 3rd to 7th June). "Foundation for the Physical Protection at Facilities Holding Nuclear or

- Radioactive Materials – Best Practice, London, United Kingdom”. Retrieved from Babcock Nuclear workshop: <https://www.babcock.co.uk>, 2013, June 04.
2. Introduction to Professional Career Development [Electronic resource]. - access mode: <https://jobtalk.indiana.edu/Courses/PCD/PCD-Syllabus.htm>. (Date accessed: 11/04/2020).
 3. World institute for nuclear security. Accountability for security and effective governance [Electronic resource]. - access mode: https://youtu.be/zz_WfI6O_Wc. (Date accessed on 02/04/2020).
 4. Garcia, Mary L., “Vulnerability Assessment of Physical Protection Systems from the Sandia National Laboratories”, (2005, May).
 5. Stacey Barr, 5 basic KPI Formulas to quantify performance measures, August 6, 2013.
 6. Key Performance Indicator. [Electronic resource]. - access mode: <https://www.klipfolio.com/resources/articles/what-is-a-key-performance-indicator>. (Date accessed: 11/04/ 2020).
 7. Impraise blog. Company culture [Electronic resource]. - access mode: <https://blog.impraise.com/360-feedback/3-performance-indicators-that-will-make-or-break-your-company-performance-review>. (Date accessed: 11/04/2020).
 8. Leigh E. Ways to measure career success [Electronic resource]. - access mode: <https://projectbliss.net/ways-to-measure-career-success/>. (Date accessed:11/04/2020).
 9. Francis-Smythe J., Haase S., Thomas E., Steele C. Development and validation of the Career Competencies Indicators [Electronic resource]. - access mode: <https://core.ac.uk/download/pdf/9554238.pdf>. (Date accessed:11/04/2020).

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ALPHA SPECTROMETRY IN EMERGENCY PREPAREDNESS

ABSTRACT

A study to assess the choice of science as a vocation and career, considering alpha spectrometry in emergency preparedness, was carried out. The