

A STRATEGIC ROLE DEVELOPMENT PRIMER FOR PHYSICS EDUCATORS IN HIGHER EDUCATION: SOME GENERAL PRINCIPLES AND THEIR APPLICATION TO THE CASE OF A PHYSICIST TEACHING IN A FACULTY OF MEDICINE / HEALTH SCIENCE

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1 INTRODUCTION

As the number of physics students dwindles in Europe and competition for students and curriculum time increases, every physics educator needs to ask himself some difficult questions. The most vital of these, are those same questions asked by any strategic planner in the development of any service: what services will my clients (i.e., students, parents, society, employers) expect in the future, what services can I provide better than my competitors (i.e., the other disciplines), how can I strengthen my role within my institution? This paper provides a strategic role development model that can be utilized by the physics academic to provide an answer to these questions. We also demonstrate how we utilized the model to produce a strategy for the role development of the biomedical physics (BMP) educator in Faculties of Medicine / Health Science (FMHS).

2 ROLE DEVELOPMENT IN EDUCATIONAL ORGANIZATIONS

Role development is an umbrella term for the elaboration, redefinition, modification and expansion of a role. Strategic planning involves the formulation of specific action plans which would take an entity (in this case a role) from its present state to a desired enhanced future state [1,2]. Roles are today diagnosed and strategies constructed in the framework of the 'open-systems model' which emphasizes that role development occurs within organizations which in turn reside in a changing *external* environment (political, economic, social, techno-scientific) to which they need to constantly adapt [3]. Various forms of the open-systems model are increasingly dominating strategic planning in higher education (HE) as universities face pressures regarding financial accountability in the use of public funds, competition from alternative private educational institutions, need to attract fee-paying students, and pressures on available resources [4,5].

3 A STRATEGIC DEVELOPMENT MODEL FOR ACADEMIC EDUCATOR ROLES IN HE

The strategic role development model for educator roles presented below is based on a pragmatic blend of various strategic planning theoretical frameworks available in the literature [1-8]. Table 1 presents a list of definitions of the necessary strategic planning concepts required for an understanding of the model.

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Table 1 Strategic planning theory concepts relevant to role development.

Marketing paradigm	The dominant strategic planning paradigm at the moment is the marketing paradigm which proposes that in order to be successful a role should aim to produce a good fit between client /societal needs and the expectations and services offered by the role.
Core competences	Role competences which serve to differentiate one role from others in such a way as to provide advantage over other roles. Identifying the core competences of a role is essential to prevent substitution of the role by a competing one.
Mission statement	A definition of the role which would allow role holders to address successfully the needs of their client groups. An essential component of the mission statement is a recognition of core competences.
Vision	The desired future state of a role within the arena of activity defined in its mission.
Position audit and SWOT audit	A position audit is an assessment of the current situation of a role. This usually involves conducting a SWOT audit i.e., an inventory of the <i>internal strengths</i> and <i>weaknesses</i> of the role and the <i>external environmental opportunities</i> or <i>threats</i> that it faces.
Gap analysis	An analysis of the discrepancies between the present state of a role and its future desired state as expressed in the vision statement.
Planning strategies	General approaches (e.g., specialization, innovation, core competence development) by which identified gaps can be reduced and vision achieved.
Actions	Specific tasks to advance a given strategy.
Client analysis	An analysis of the clients of a particular role and their expectations of the role.
Forecasting	An accurate assessment of expected future trends. This is essential for strategic planning - which is intrinsically a <i>future oriented</i> activity.
'Market' forces	Factors in the future external environmental in which a role operates which would be highly relevant to the development of the role.
Portfolio analysis	Analysis of the various services offered by a role to enable strategic decisions regarding these services (e.g., increased development, mere continuation, reduction or termination). An essential component is the identification of core competences.

The main steps in the model are:

- a) A position audit of the role using the SWOT methodology,
- b) A portfolio analysis for the role (identification of clients and core competences) from the results of the SWOT audit,
- c) Forecasting of key 'market forces' from the SWOT audit,
- d) Formulation of a mission statement for the role,
- e) Formulation of a vision statement for the role,
- f) Carrying out of a gap-analysis,
- g) Formulating strategies and actions for gap reduction using the SWOT matrix technique (Table 2). This is a systematic framework for linking

strengths and weaknesses with opportunities and strengths in order to formulate specific strategies and actions aimed at gap reduction [7].

Table 2 The SWOT strategy matrix.

	Strengths (S)	Weaknesses (W)
Opportunities (O)	SO Strategies: specialization, innovation, core competence development and promotion	WO strategies: strengthening of weak, competences, resources and organization, diversification
Threats (T)	ST Strategies: alliances and mergers	WT Strategies: elimination of weaknesses

4 APPLYING THE STRATEGIC PLANNING MODEL TO THE DEVELOPMENT OF THE BMP EDUCATOR ROLE IN FMHS IN EUROPE

Mission statements guiding BMP educator role holders within the FMHS have too often been based on the ill-defined ‘physics is the basis of all things’ approach. This has led to highly variable servicing with content ranging from general non-applied physics to physical biochemistry, biomolecular and cellular biophysics, physiological physics, the effects of physical agents on the human organism and medical devices. This absence of focus when coupled with the limited curriculum time available has often resulted in shallow content with little relevance to the situation faced by healthcare professional (HCP) students in the clinical areas. The role is hence under threat as in the current HE economic climate BMP services are only requested by HCP programme directors *if they are perceived as being of significant value to their programmes*. Using the above role development model we have formulated a detailed strategic plan to ensure that this threat is nullified and that the future well-being of the role is assured. A summarized version of the process follows.

4.1 Position audit using the SWOT methodology

Table 3 lists the most noteworthy SWOT themes for the BMP role. The S - W themes were identified via a qualitative survey of BMP departments and curricula within FMHS from EU states (115 faculties in total). O - T themes were inventorized via a systematic survey of the healthcare, educational, and techno-scientific literature.

4.2 Portfolio analysis

Table 4 shows a small section of the portfolio analysis. A content area is only considered as a core competence if the answers to the questions in the second and third columns of the table are both a resounding ‘yes’ [8].

4.3 Forecasting of key ‘market forces’ from the SWOT audit

The key forecasted ‘market forces’ for the BMP educator role are:

- a) The EU Tuning initiative for the increased harmonization of HE programme learning outcomes (arising as a consequence of O1),

- b) The emphasis on effectiveness, safety and efficiency in healthcare (O2, O3, O5),
- c) Increase in the number of HCP requiring servicing (O4),
- d) The rapid expansion in number and sophistication of medical devices (O6).

Table 3 SWOT inventory for the BMP educator role in Faculties of Medicine / Health Science.

Strengths of the role:	Weaknesses of the role:
S1) High level of subject pride among BMP S2) High esteem for BMP amongst HCP S3) Strong medical device competences S4) Strong competences regarding safety with regard to <i>physical</i> agents S5) Strong research competences S6) Strong scientific norms and values	W1) Absence of a clear mission and role ambiguity W2) Inappropriate role boundaries W3) Absence of international networking W4) Absence of harmonization of curricular content W5) Low awareness of importance of educ. research W6) Weak educator competences W7) Weak strategic planning / marketing competences
Opportunities for the role:	Threats to the role:
O1) EU goal of facilitating HCP mobility O2) EU directives regarding medical devices and patient and occupational safety O3) Increased awareness of patient safety standards in healthcare O4) The rise of the HCP: new HE based programmes, new HCP and expanded roles O5) Increased awareness of occupational safety O6) The explosion in the number and sophistication of medical devices	T1) Resistance to multi-disciplinarity in healthcare professional education T2) The escalating cost of HE T3) Low incentives for BMP to join academia

4.4 Mission statement

The portfolio and 'market forces' analysis point to the following mission statement for the role, one that would ensure future relevancy to the HCP: "*BMP educators will make a decisive contribution to quality HCP education through the pursuit of practice-oriented curriculum research, development and delivery in the physics competences necessary for the scientific, effective, safe, ethical and efficient use of biomedical devices and the supervision of student research involving such devices*" Biomedical devices are strongly underpinned by physics principles. They are crucial to modern healthcare and the subject of several EU directives, hence offering an excellent opportunity for role consolidation. In this context 'effective' means ensuring that the intended healthcare purpose for which the medical device is utilized is achieved. 'Safe' refers to the avoidance of unnecessary risk to patients and the total elimination or reduction to acceptable levels of risks to users and others from physical agents

associated with devices. 'Physical agents' refers to ionizing radiation, mechanical, electrical, acoustic, ultrasonic, magnetic, electromagnetic, high temperature, optical, ultraviolet, infrared, and laser risk sources. 'Efficient' refers to the extent that purpose is achieved at minimum device use time.

Table 4 A small section of the portfolio analysis for the biomedical physics educator role.

Biomedical Physics content area found in present curricula in Europe	Difficult to transfer to another role?	Highly requested by HCP groups?	Core Competence?	Comments
General non-applied physics	Yes	No	No	On the way out at EU level - all HCP expect physics <i>applied</i> to the biomedical field.
Biophysics of perception	No	Yes	No	Taught also in physiology so is not a BMP core competence (role overlaps should be avoided to reduce risk of substitution by another competing role).
Laser devices	Yes	Yes	Yes	Definitely a core competence for the BMP.
Safety from ionizing radiation from medical devices	Yes	Yes	Yes	Definitely a core competence. Radiation protection training is a legal requirement (EC Directives 96/29/Euratom, 97/43/Euratom).

4.5 Vision statement

The following description expresses the proposed vision state for the BMP educator role in the FMHS: *"The BMP educator will be recognized by healthcare professional leaders across Europe as the academic of first call in the biomedical devices education domain, perceived to be providing a practice-oriented, competence-based, well-integrated, research-based, internationally harmonized, ethically moderated, contribution to the education and research endeavours of healthcare professional students."*

4.6 Gap analysis

The gap analysis identifies discrepancies between the desired future state of the role (vision) and the actual present state of the role. The main discrepancies were:

- a) The BMP is *not* presently recognized by HCP leaders across Europe as the academic of first call in the biomedical device education domain (arising from W1, W7),
- b) The BMP contribution to HCP education in Europe is far from satisfactory (W5, W6),
- c) Very few BMP curricula are practice-oriented, competence-based and research based (W5, W6),

- d) International harmonization of curricular content is almost non-existent (W3, W4),
- e) Horizontal and vertical integration of the BMP contribution within HCP curricula is not satisfactory (W5, W6),
- f) Ethical / humanistic considerations are not being given sufficient attention (W1, W2),
- g) There is little involvement in student research involving devices (W1).

4.7 Strategies and actions for gap reduction using the SWOT matrix technique

Examples of strategies and actions for the reduction of gap (a) are presented in Table 5. Similar strategies and actions have been formulated for the other gaps.

Table 5 Examples of strategies and specific actions to address gap (a) identified in the gap-analysis.

Strategy	Specific Actions
Specialization	Focus on and concentrate resources on core biomedical device competences as articulated in the proposed new mission statement, Disseminate the mission statement among the international BMP and HCP communities, Design and disseminate a curriculum development model which would reflect the new proposed mission statement, Be a proactive advocate for the scientific, effective, safe, ethical and efficient use of - biomedical devices within the FMHS, Promote oneself as a medical device consultant both internally within the faculty of health science and in the community.
Innovation	Set up clinically oriented biomedical device based programmes within the faculty, Develop the concept of a 'biomedical device skills laboratory'.

4.8 Discussion

Although the BMP educator role has intrinsic strengths which can be exploited, the role has been generally weakened by neglect from role holders who have not practiced proper role balance amongst their various academic roles - in particular the educator role has not been given its due importance as a result of an over-emphasis on the discipline research role. However, the opportunities for the role are tremendous and should role holders rise to the occasion a good future for the role is assured.

5 CONCLUSION

We have outlined a strategic planning development model suitable for HE academics to develop their educator roles. We have also illustrated the use of this model for the development of a strategy for the enhancement of the BMP educator

in a FMHS. We do however emphasize that *the model is in fact generic and can be utilized by any physics educator to strengthen his role at any level of the educational system.*

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