An Academic Community of Practice Model (ACoPM) for Empowering Breakthrough Ideas in Multidisciplinary Environments

MARIA JAKOVLJEVIC

SCHOOL OF COMPUTING, COLLEGE OF SCIENCE ENGINEERING AND TECHNOLOGY, UNIVERSITY OF SOUTH AFRICA (UNISA)
Email: jakovm1@unisa.ac.za

Abstract: There is little in the research literature on academic communities of practice that will engage academics in the development of breakthrough ideas and products increasing spirit of collaboration and innovation among colleagues in community. The aim of this paper is to explore appropriate academic collaborative design environments and create a model of academic communities of practice.

This research was based on a qualitative approach where observations and document sources were used to gather data. A community of practice group consisting of a researcher, a mechanical engineer, a knowledge expert and an administrator was observed and their experiences were investigated through document sources. An ACoP model was developed based on an extensive literature survey and innovative experience of four experts formed into a multidisciplinary academic CoP group.

Keywords: Academic communities of practice model, Breakthrough ideas environment, Innovation, Multidisciplinary, Community

1. INTRODUCTION

A major cause of inadequate productions of breakthrough ideas in academic institutions is due to a lack of appropriate models for forming academic communities of practice in a synergy with businesses and community. Research findings assertion that a suitable framework for building effective communities of practice as the main driver for innovative knowledge exchange at institutions of higher education are missing [40]. Communities of practice (CoP) are "groups of people informally bound together by shared expertise and passion for a joint enterprise" [46]. It is not clear how CoP could be integrated within current academic institutions.

The theory and practice indicate that issue of collaborative multidisciplinary research becomes a need that requires an urgent attention of researchers, community and government bodies [30] [41] [3]. It is necessary to produce strong bonds with industry through business creativity support [3][4]. Furthermore, there is the need to understand the underpinnings of innovation through collaboration with entrepreneurial companies [42] [4] in a synergy with technology development[35].Researchers indicates that educators must have a range of creative knowledge and skills all working together over a long span of time within and across grade levels and disciplines [20][1]. Academics are isolated from organisational institutions and other community stakeholders in terms of creating breakthrough ideas of a multidisciplinary nature in collaborative community environments [18][22[]. There is no model in creating voluntary academic communities of practice to nurture discovery ideas in developing countries.

The main purpose of this study is to create a multidisciplinary model for enabling academic communities of practice to solve real-world problems in community and engage in innovative endeavours.

This study is divided into two phases: In the first phase, the framework for an effective forming of academic communities of practice environment is established, culminating in the development of an ACoP model and its deployment. The following research questions were set for the first phase:

1. *What are the crucial components of the ACoP model that can promote breakthrough ideas in collaboration with community?*
2. *What are barriers in establishing adequate academic CoP initiatives?*
3. *What are the perceptions of members in terms of generating breakthrough ideas through the ACoP model?*

In the second phase of the research, the model will be adjusted and implemented at two high schools at Gauteng Province in South Africa to ascertain the answers to the following research questions:

1. *What is the extent of the impact of the ACoP model on innovative initiatives?*
2. *How often and for what duration do teachers engage in ACoP?*

This article is organized as follows: firstly, the framework for academic communities of practice is discussed leading to the creation of a preliminary ACoP model. Next, the research methodology is described and preliminary findings are produced.

This article concludes with an overview of practical implications and future research.

3. THE FRAMEWORK FOR CREATING AN ACADEMIC MULTIDISCIPLINARY COMMUNITIES OF PRACTICE MODEL

3.1 Describing Communities of Practice

Communities of practice (CoP) are informal voluntary groups with a ability to engage and inspire its members that makes them successful over longer periods of time [48] through discussions and common interests [45] in a relation to a real-world problem or tasks in the practice [32]. CoPs identify gaps and solve problems in community through requesting information; seeking experience, coordinating and collaborating, documenting project mapping knowledge [47] and practice informal communications through agile group dynamics [19] [16] [48].

3.2 Some Theoretical Perspectives on CoPs

The constructivist approach that focuses on knowledge construction and the development of reflective awareness [27] [22] are generally accepted theoretical perspectives on CoPs. Additionally, CoPs trace their origins in sociocultural and socio-constructivist perspectives on learning and collaborations [44][49][34].The principles of Community of Practice Theory (COPT) and Actor-Network Theory (ANT) act as a theoretical background for guiding CoP activities [17].

3.3 Forming Academic Multidisciplinary CoPs

An innovative practice and a multidisciplinary approach becomes a social need that requires urgent attention from educationalists and community stakeholders. Knowledge in one discipline could be transferred to another discipline through homological transfer [28][41].

Academics lack a powerful connection to CoP opportunities [7] but their challenges, needs and creative prerequisites need to be built through the development of communities of practice [10]. CoP teams last as long as they have value to their members in promoting multidisciplinary knowledge and practice [5][37]. They could grow through collaboration with entrepreneurs who possess a passion for innovation ([4][3][31]. Academics are missing connections with businesses in terms of innovation [39] since educational managers seldom possess innovation literacy and readiness to create an innovation atmosphere. Multidisciplinary teams in organizations that may interact formally or informally are highlighted in current research [30]. However, multiple obstacles exist for multidisciplinary connections such as: outdated innovation infrastructures, an inadequate multidisciplinary innovation culture, the lack of management support and the teaching overload [39].

3.4 Enhancing Breakthrough Ideas through Academic Communities of Practice

Four primary dimensions of creativity, invention and innovation are crucial in understanding the processes of generating breakthrough ideas, such as: estimation and communication of creativity, invention, and innovation; practice of creativity, invention, and innovation; knowledge of creativity, invention, and innovation; managing creativity, invention, and innovation [24][11]. Invention is a creative idea and innovation is a process, while invention is an application of the idea through a product, process or service [9] [14] [36]. The flexibility and informal nature of ACoP teams could provide an opportunity to develop all four dimensions that can trigger 'knowledge fermentation,' and therefore, through knowledge sharing and transfer an ACoP environment could pave the way for breakthrough ideas [24].

The facilitation of breakthrough ideas demands an active involvement and a synergy between researchers and community members as stakeholders. Members of an ACoP group must know how to organise, synthesise, share and manipulate breakthrough ideas constructively. Managing the process of creating breakthrough ideas offers entrance to an individuals' exceptional ability to generate new knowledge, which can be made available to community collaborators, institutions, and society as a whole. Thus, appropriate guidelines are necessary in developing a meaningful breakthrough atmosphere [24].

Seven principles developed by [48] for CoPs can enhance the breakthrough idea environment such as: design for evolution, open a dialogue between inside and outside perspectives, invite different levels of participation, develop both public and private community spaces, focus on value, combine familiarity and excitement and create a rhythm for community.

3.5 Current Barriers for Innovative Endeavours

There are nine 'environmental obstacles' that inhibit creativity namely, an inappropriate reward system, lack of freedom, organisational disinterest, poor project management, inappropriate evaluation processes, insufficient resources, time constraints, overemphasis on the status quo, and competition [2].The key elements to unlock creative inspiration, such as: discipline, routine for creative work, one's own efficiency/construction system and spontaneity are often misunderstood [6][8]. This leads to occasional fulfilments of the well-known five routes to awaken innate creativity: identification, information

gathering, idea generation, idea evaluation and modification, and idea implementation [43].

3.6 An Inspiring ACoP Leader

An innovation champion is a person energetic and enthusiastic enough to inspire and keep the spark of innovation going within an ACoP team. A leader must be motivated and have technical knowledge, must be an innovation sponsor, a technological keeper and a good communicator [33]. Researchers, [26] [15] specify the responsibility of leaders in supporting creative ideas. Thus, the value in promoting innovative ideas emerges from an inspiring ACoP leader/ facilitator/ coach/moderator. A CoP group leader acts as a gentle guide or facilitator that includes the duty of opening the community environment for discussion of goals, evaluations and peer evaluation and self-evaluation [5].

3.7 ACoP as Knowledge Sharing Intermediaries

The researchers [37] proposed the work on real-world projects by integrating learners' teams into the communities of practice. The learner teams are connected to each other and to their supervisors, community members, companies and academia. The researchers detected problems with design flaws, cultural and professional diversities. Therefore, it is necessary to design and strengthen ACoP as incubators, to develop a platform for a gradual integration of communities of practice learners' teams.

Knowledge sharing and transfer depends on individual characteristics, experiences, values, motivation, and beliefs [6][21]. Merely sharing and transferring knowledge in institutions is not enough if it is not effectively applied to solving problems and delivering products and services [12]. There is a possibility to form a group of scientists to act as 'knowledge intermediaries' or brokers by sharing knowledge across disciplines and institutions [24].

Brennan and Dooley (2005) introduce the concept of *network creativity* that includes creativity of an individual, creativity of a group and organizational creativity. Organizations must consider creativity of individuals, groups, the whole system and create the strategic frame of the organization in order to choose an adequate intervention methods in stimulating creativity [31][18].

3.8 Current models and perspectives for ACoP

Different models and perspectives exist that could provide a solid theoretical and conceptual framework for the creation of an ACoP model. An e-learning instructional programme and the instructional web design programme with multiple components for enhancing learning are applicable for any knowledge sharing endeavour [23]. The OMKI model of innovation in organizational settings provides an in-depth explanations of network creativity, internal and external barriers for innovation [25]. A conceptual model of creativity, invention and innovation (MCII) for entrepreneurial engineers highlights many aspects of a creative climate, multidisciplinary and collaborative features that could inspire academics and other stakeholders to undertake multiple knowledge exchange activities [26].

4. THE MODEL FOR ACADEMIC COP

Based on theoretical and conceptual perspectives it is assumed that the identification of an appropriate academic communities of practice model may deeply engage academics in breakthrough ideas in a real-world context. Having discussed the key aspects of academic CoP, we now turn to a conceptual model for facilitating breakthrough ideas that is in line with the theme set out in the introduction.

4.1 The Components of the Academic CoP Model

Figures 1a and 1b present the following key academic CoP model components:

Phases: Phase I: Foundation (the idea generation, formation of the core group); Phase II: Planning & Requirements (roles, activities, technologies, risks, costs, communications, requirements and an initial design); Phase III: Initial Design (funding, intellectual property rights (IPR), design of a paper prototype); Phase IV: Competence Development (an advanced prototype design with telemetry and robotics); Phase V: Sustainability (final prototype, evolving breakthrough ideas); Phase VI: Evaluation (commercialization, the way forward).

The Core Team: researcher(s)/academic, knowledge expert, engineer, project manager, administrator. *Extended team members*: electrical, mechanical and/or software engineer; IPR and funding advisors.

Roles, Tasks and Activities: A predefined set of roles, tasks and activities were allocated in the model. *Time planning*: The start time must be manually entered. The end time is calculated through the software indicating the project advancement in terms of activities and phases. *Critical Performance Indicators* (CPI) and *Assessment Criteria (AC*) are designed for each phase and activity (See Figure 1a and Figure 1b).

Figure 1a: The Academic CoP Model (an overview)

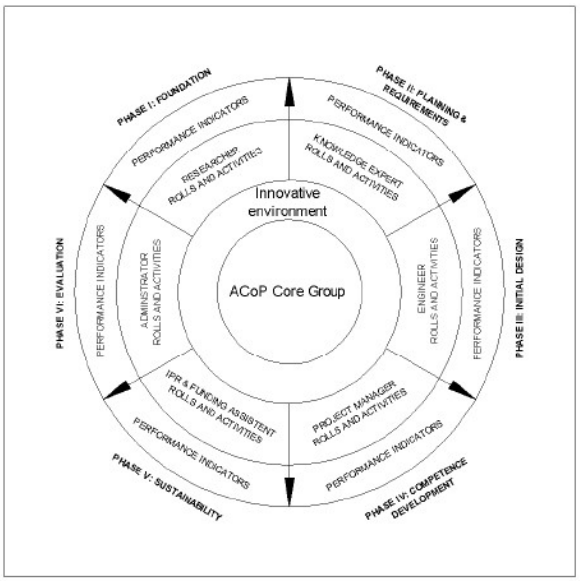

Figure 1b: The Structure of the Academic CoP Model

4.2 The Academic CoP Model Deployment Procedure

The ACoP group gathered together with an aim to find an ICT solution and develop a learning device for physically disabled students. The main aim of the ACoP group was to develop a paper prototype of a learning device that reflects ICT capabilities, robotics and telemetry. The ACoP model served as a guide during design activities.

The researcher, the knowledge expert and the engineer developed a design template with detailed drawings. The administrator sent invitations with agendas to the members, recorded all communications and provided minutes of meetings. The project manager didn't join the group. The responsibility to check project risks, project advances, time frames and reporting were shared between the group members. During design activities multiple design templates were used such as: general checklists, design checklists, logical checklists [32].

5. RESEARCH DESIGN

5.1 Research Approach

This research can be described as exploratory, descriptive, seeing that the experience of ACoP members are being investigated relating to a specific context [13][29]. Qualitative research design characterises the complexity of data and the need for a simultaneous analysis and data gathering procedures.

5.2 Profile of the ACoP Members

The study sample consisted of one ACoP group with four members: the researcher was affiliated to an intuition of higher education in Croatia, the engineer was affiliated to a private company in Croatia; the knowledge expert was affiliated to a primary school in Croatia; the adminstartor was employed in a private entrepreneurship company in Croatia. Participants presented a purposive convenient sample, as they were available and inexpensive to this study [29].

5.3 Data Collection Methods

The data was collected by means of observations, and documents analysis which satisfy the criteria for triangulation [51][29]. The researcher played the role of participant-as-observer and collected the rich detailed data obtained from members during ten sessions in natural settings [29]. The researcher also acted as an expert demonstrating and modelling design activities. Meetings were held for two months once a week, with duration of two hours per session.

CoP members were observed and their experiences related to the innovative indicative on the design process and perceptions of the model were evaluated. Data gathered through observation were recorded immediately after the session in a form of observer comments. The documents (agendas, minutes, the design template, e-mail communications) were used to determine the design progress and the activities performed [29].

5.4 Data Analysis

Data analysis consists of examining, categorizing, tabulating, or recombining the evidence to address the initial prepositions of a study. A constant comparative method was applied in analysis of observational data. During the process of analysis four categories were derived. Themes that were detected through the analysis of the data were

segmented into categories and were supported by evidence [13].

5.5 The Assessment of Trustworthiness

Few strategies to improve internal validity were considered in this study, such as peer/colleague examination [34]. A rich description of phenomena, which was embedded in the theoretical framework, contributed to the internal and external validity and reliability of this study [22][29].

6. RESULTS

Emerging from observations relating to the ACoP members' experience of the model during design of a learning device the following findings were derived:

a. *The crucial role of a leader in motivating, maintaining and inspiring members*

The researcher commented in the observation protocol: "the team members were constantly inspired …it was necessary to keep an enthusiasm and the excitement of discovering new solutions… 'creative energy' must accumulate in order to produce a creative spark…".. Observations revealed that members were happy with the creativity and an endurance of the ACoP leader who provided a point of departure for the development of an environment for breakthrough ideas. Members attentively followed the advices from the group leader adding new components into the design template on a weekly basis. The leader initiated the ACoP and served as a facilitator during the meetings and a designer of the proposed learning device

b. *The need for a project manager, a fund raiser and an associate for IPR*

The administrator reported in the minutes: "…all members should share admin tasks. We need a project manager and a fund raiser". The engineer remarked: "we have to concentrate on the design …how get funding and how to protect our design?" Observational notes revealed that project skills, funding skills and IPR skills were missing. There was no fund available at the time when the group started to function.

c. *Barriers for sustainability of the ACoP*

Some obstacles were observed such as: the core group had only four members, a senior researcher and a project manager didn't join the group. The responsibilities were split between existing members. Observation notes revealed the following barriers in the work environments of the ACoP members that influenced the dynamics and the final output of the ACoP group: a deprived innovation culture and practice, a limited or no management support and inadequate financial resources. Freedom, support and understanding of creativity endeavours are absent in their companies.

d. *The multidisciplinary environment provided an opportunity for breakthrough ideas*

It was observed that members brainstormed many solutions from different perspectives in order to solve the community problem of enhancing learning through an ICT device. Members showed a great interest and motivation as everybody was a stakeholder visualising the final product. Observation notes revealed that members were immersed in discussions, asking questions, expressing their opinions and frequently comparing different innovative solutions from multidisciplinary perspectives.

Textual, visual auditory and ICT features of a proposed learning device were discussed. The researcher commented "I think auditory elements are more important as students need this type of guidance". The paper prototype has innovative features of robotics and telemetry that was considered as a breakthrough in enhancing learning processes for disabled students. It was observed and recorded in minutes that the model helped with organizational issues. However, poor time planning and a lack of project management influenced the final project outcome.

7. DISCUSSIONS

The literature review and findings indicate that academics need to form multidisciplinary CoP networks that will promote innovation culture, connect institutions with the community in solving real-world problems. Informal gatherings and an awareness of producing something that can be commercialised empowers individuals to share their knowledge and transform solutions in highly innovative ways.

The first research question attempts to define *key components of the model* such as phases, roles, the core team structure, tasks, activities, risks, time frames, assessment criteria and key performance indicators. It was ascertained that that it is necessary to have an initiator of the ACoP network a creative individual who can serve as an inspiration for innovative activities. It is necessary to initiate communication dialogues on all levels between academics, business partners and community. Applying the model, it was possible to pay attention to individual differences such as personality,

motivation, will, attention, character, creativity, and other important and significant human capacities [24]. Members and the facilitator felt that the ACoP model with its components was an appropriate tool for effective innovative activities since the organizational matters were resolved and roles contributed to the clear task designation (*in response to question 1*). However, all expertise must be available in addition to funding resources.

The second research question seeks to determine *barriers for establishing adequate academic CoP initiatives.* Evidence confirmed that some barriers in members' work environments influenced their contributions within the ACoP group. Managers were not supportive and no financial incentives were offered. The activities within the ACoP group were not accepted for performance agreements and promotions. Barriers for establishing adequate academic CoP initiatives are multiple, for example, poor institutional innovation practices, a little understanding of communities of practice, the tuition overload, and inadequate financial resources, the lack of an organised creative work.

Providing adequate support to members through academic CoPs to become more connected and competitive is of increasing importance in minimising barriers for creativity (*in response to question 2*).

In answer to the third question about *empowering breakthrough ideas through the ACoP multidisciplinary environment* it can be said that every educational institution requires a special infrastructure in enabling academic communities of practice. The fact that members were involved in the generation of an innovative solution to the real-world problem positively influenced their innovative capabilities. The evidence indicated that members were sharing multidisciplinary knowledge through dialogues and modelling that culminated in a new insight to the identified community problem."[A genius] does not know himself how he has come by his ideas, and he has not the power to devise the like at pleasure or in accordance with a plan" [38].The ACoP multidisciplinary environment provided an opportunity to create a breakthrough idea due to its high spirit of innovation and collaboration (*in response to question 3*). The next section presents the most important conclusions, limitations and further research.

8. CONCLUSIONS, LIMITATIONS AND FURTHER RESEARCH

The implementation of the CoP model revealed new paths in the facilitation of breakthrough ideas in multidisciplinary collaborative environments. The results strongly support the following general conclusions:

1. Designing innovative solutions within ACoP multidisciplinary teams requires an organizational and administration support in addition to IPR and funding assistance in a reasonable time frame.
2. Academic CoP groups as voluntary and informal groups and not seen as a part of a 'normal' academic environment. ACoP networks must be recognized at institutions in terms of performance recognitions and promotions.
3. Multiple barriers exist for forming academic communities of practice, for example: a deprived innovation culture, poor institutional innovation practice, a low opinion of communities of practice, the teaching overload, a limited or no management support and inadequate funding resources.
4. ACoP multidisciplinary environments provide an opportunity to create breakthrough ideas since the organizational matters are resolved and roles allocations deliver clear tasks designations.
5. The ACoP core group management is an important factor in the ability to innovate because the core team leader should have a great influence on the development of group vision and strategy.

In conclusion, the baseline of this research study with innovative guidelines provided a model that could be applied at academic institutions in South Africa and abroad.

Contributions/originality and value-add: The theoretical outline and findings of this study provide a solid basis for an integrated academic CoP framework. Several crucial aspects of academic multidisciplinary CoPs are described that could empower innovation initiatives in the community. The preliminary model can be used for further research in the teaching environment as proposed for the second phase of this study.

Limitations: A variety of previously identified barriers prevented the ACoP group to produce the full working prototype.

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