# A Model of Academic Community Entrepreneurship (ACE): Initiation, Innovation, and Impacts of PICMET

Min-Seok Cha

Changwon National University, Dept. of Business Administration, Changwon, Kyungnam, South Korea
Portland State University, Engineering and Technology Management Dept., Portland, OR - USA

***Abstract*--Entrepreneurship is the process of creating problem solving system that generate knowledge and provide value. It is also seen as an innovation engine. It could be applied in many fields including academic community. This attempt of creating academic community can be view as an academic entrepreneurship. The impactful process of academic entrepreneurship is worthwhile to be noticed and shared. Because PICMET has shown a model of building a sustainable scholar community and its coordinating organization in the international level, it could be a successful case of academic community entrepreneurship (ACE) Model. ACE is focused on creating new value of academic and practical knowledge and social capital through participation and collaboration. As a scholar, the founder and his team could be an innovator as lead users in the academic community platform. It was a vigorous attempt of lead scholar in the Management of Engineering and Technology field. Its biannual rotation of the location with support of many international partners, publication of peer-reviewed proceeding, and department of ETM at the hosting institution are all contributing forces. The archive and ethnographic case studies are utilized to build refined ACE model with multiple layered process research. New model of entrepreneurial journey, entrepreneurial career staged ACE-HEROS model sheds light on the ACE model. This research aims to provide the platform of remembering and depicting engaged scholarship that has reached realm of academic entrepreneurship. The measuring of PICMET impact is still challenging but the qualitative categories are proposed to suggest some constructive response to the dedicated academic entrepreneur and community. This is also a call for collaborative researches on our community in the future.**

## I. INTRODUCTION

Every life is problem solving and the entrepreneur solves special problems[1]. Social innovation by scholars, engineers and entrepreneurs are innovative attempts to solve various problems in the society and economy. Entrepreneurship has been generalized and substantially developed to be applied to public and academic sectors[1], [2]. Entrepreneurship can appear many domains other than commercial sector. This attempt of creating academic community can be view as an academic entrepreneurship. There can huge tension between academia which pursues discovering truth and the enterprise which attempt to create value and demand another commitment. The impactful process of academic entrepreneurship is worthwhile to be noticed and shared. The scholarly attempts to grasp the meaning and the process of enterprising an international conference is beneficial to many emerging and established scholars in the entrepreneurial

university. There can be many spin-offs that create a commercial value as well as social innovations that create public value to the academic community and the region.

Engineering and Technology Management (ETM) field has grown significantly and PICMET (Portland International Conference of Management of Engineering and Technology) has been a platform to innovate field of management and society for 25 years till now[3]–[6]. The educator and scholar, Dr. Kocaoglu has shown a role model as lead researcher and editor in the Engineering Management field for more than 10 years before founding the academic community that will impact on our field. So the time span of the academic entrepreneurial career can be long as 35 years. Of course, there have been a few seminal attempts to figure out the impact of PICMET within the academic community with quantitative methods [7], [8].

This research adopts and develops multi-method qualitative methodology using combination of case study methods [1][7]–[9]. Although this research shows the partial applications of the theory building method [2], the Multiple Layered Process Research (MLPR) method are relevant to reveal the complex and dynamic nature of entrepreneurship. We experience the international conference as presenters and audiences. The operational process of the conference begins long before the actual gathering. Moreover, the conference evolves through time span from biennial to annual and from regionally bounded to borderless global community. From the perspective of the entrepreneurship, the initiation and innovation of the endeavor has deeper layers in the phenomenon. The impact of PICMET can be addressed with more collective participation because the actual effects of knowledge dissemination can reach to the practical field of industry as well as the educational classes. So the benefit or impact of creating an academic community is very broad and deeper to be grasped here. However, we could identify the categories of the impact for the further researches within the community.

Entrepreneurship consists of many kinds of method and meanings of individual, institutional, and economic layers. Entrepreneurship is a process of creating a problem solving system at the macro level as well as a way of perceiving, thinking, and acting to create and realize new values through innovation at the micro level. The impact could be creating social, intellectual, and human capital in addition to commercial revenue and profit. Because PICMET has shown a successful model of building a sustainable academic

community, the case can be excellent foundation of empirical research. The experiences as a participant, volunteer, presenter, and observant as well as the comparative experience at the different conference can be baseline approach. Moreover, there are huge archive at the web pages and the brochure. The ethnographic approach and case study can be untapped during contacts with founders and its coordinating organization.

Internationally successful case of academic community entrepreneurship (ACE) can be a role model and learning-bed for many scholars and academic practitioners as well as the policy maker of entrepreneurial university. ACE model is focused on creating new value of academic and practical knowledge and social capital through participation and collaboration. That is what this era demand for the incumbent university. The incubating organization or institution could play important role in the process of enterprising. The habitat of resource, region, and institution are breeding-bed for the new endeavor. So the multiple-layered approach is really important to build the ACE model. We call it HEROS that is an acronym of habitat, entrepreneur, resource, opportunity, and synthesis. The aggregate of diverse process of emergence and evolution for dozens of years could be grasped with collective efforts. This research is more about the vision of further inquiries rather than definite answers and final solutions for our academic communities.

Primary objective of this research is to record and reflect the successful achievement as well as many experiments of PICMET. ACE model can be more specified with MLPR method to HEROS layers. Hopefully this could create a set of constructive recommendations for the future of PICMET. This research is designed for several layers of investigation [2], to build ACE-HEROS model of a new academic entrepreneurship: Participating, observing, experiencing, archiving and interviewing. This is the early stage of model-theory building so that the paper consists of content analysis of archives, and retrospective reflections as the observatory participants. Finally, we aim to propose multi-layered process model of HEROS-4IS (HEROS: Habitat, Entrepreneur, Resource, Opportunity, and Synthesis; 4IS: Ideation-Search, Initiation-Start, Innovation-Success, and Impact-Significance). So, MLPM (Multiple Layered Process Model) to address ACE phenomenon can be meaningful to shed light on dynamic natures inside the entrepreneurial process.

This research can be meaningful endeavor to show the successful role model scholars' preparing, enterprising, and innovating activities with interaction with habitat, restraints of resource and nexus of opportunity. The PICMET is very interesting professional user innovation case. The founder, Dr. Kocaoglu can be seen as lead scholarly user of conference service who looks for the solution to the authentic needs and problems he felt in 90's at Portland, Oregon. More researches and tutorials can be tributes to his and his founding team as

well as dozens of volunteers who dedicate months for the successful conference. This is the beginning of ACE model building on PICMET so that the case interview questionnaires are shared at the Appendix for the collective inquires in the future. Sense making of organizational members is crucial for the adaptation to the changing environment and the identity formation [10]–[12]. The legacy of role model scholar should be shared and sustained as long as possible. Here a holistic framework of ACE-HEROS can be an academic contribution in addition to developing MLPR method. The model is applied to explain the dynamic and complex nature of the multiple layered dynamic phenomenon of academic community entrepreneurship, which can be meaningful challenge for the collegiate scholars.

## II. THEORETICAL FOUNDATIONS

### A. Multiple Staged and Layered Entrepreneurial Process
1. Entrepreneurial Process: Stage models

Entrepreneurial process is constant flux so that it is challenging enterprise to grasp all the aspects of the streams. One of promising approach is stage models that stems from organizational life cycle (OLS). New enterprise can be seen as an organic entity that has birth, growth and maturity. There have been ma process of firm growth has been studied with organizational life cycle [13]–[18] Growth stages can be defined as organizational configurations that are distinct in contextual and structural dimensions[13][14]. Usually, three and four growth stages of startup, growth and maturity are common.

The entrepreneur's developmental stages are strongly associated with the organizational life cycle, though the preparation or study stages are prolonged by a few years to decades. We adopt the four stages of entrepreneurial career to focus on the role model entrepreneur [1]: Study(Search)-Ideation, Startup-Initiation, Success- Innovation, and Significance- Impact. These career stages can be aligned with the organizational life cycle if the preparation stage is added to the OLS. However, the entrepreneur's career can be attached with the founding organization or not. That is case by case. This case study have highly aligned so that the different level of analysis have congruent distinction of OLS stages and entrepreneurial career stages.

The entrepreneurial careers are different for the competence, motivation, method, and the transformation of entrepreneurs. Role model entrepreneur could have positive influences on the potential and nascent entrepreneurs. However, the career path can be dissonant for the differently characterized career. Figure 1 shows 16 types of entrepreneurial career based on 4 dimensional dichotomy of stage model.

TABLE 1. ENTREPRENEURIAL CAREER STAGES

| Stage | Characteristics | Variables |
|---|---|---|
| Study | • **Period of accumulating experience** through education and employment before start-up<br>• Formation of the moral character and values of the general entrepreneur | • Education/experience in related field<br>• Accumulation of experience<br>• Development background<br>• Personality/character |
| Start-up | • Process of entrepreneurs striving to seize opportunity and pursue opportunity<br>• **Formation of a start-up** and initial start-up funding | • Start-up motivation<br>• Start-up opportunity<br>• Start-up process<br>• Industrial life cycle |
| Success | • Pursuit of management principles **for the success of the company** and management strategies<br>• Manifestation of entrepreneurial leadership in terms of the organization and network formation | • Entrepreneurial approach<br>• Management principle<br>• Networking<br>• Leadership |
| Significance | • Solution search for **sustainable growth** of the company and establishment of crisis management system<br>• Reaping profits of successful enterprise and **performing social contribution activities** | • Sustainable growth method<br>• Crisis management<br>• Harvest strategy<br>• Social responsibility and contribution (philanthropy) |

**Source:** Z.-T. Bae, M.-S. Cha, Y. Kim, and J. Lee, "Entrepreneurial Career Stage Models: Case Studies of Successful Role Model Entrepreneurs."*Korean Management Review,* vol. 41, no.1, pp.89-109, 2012.
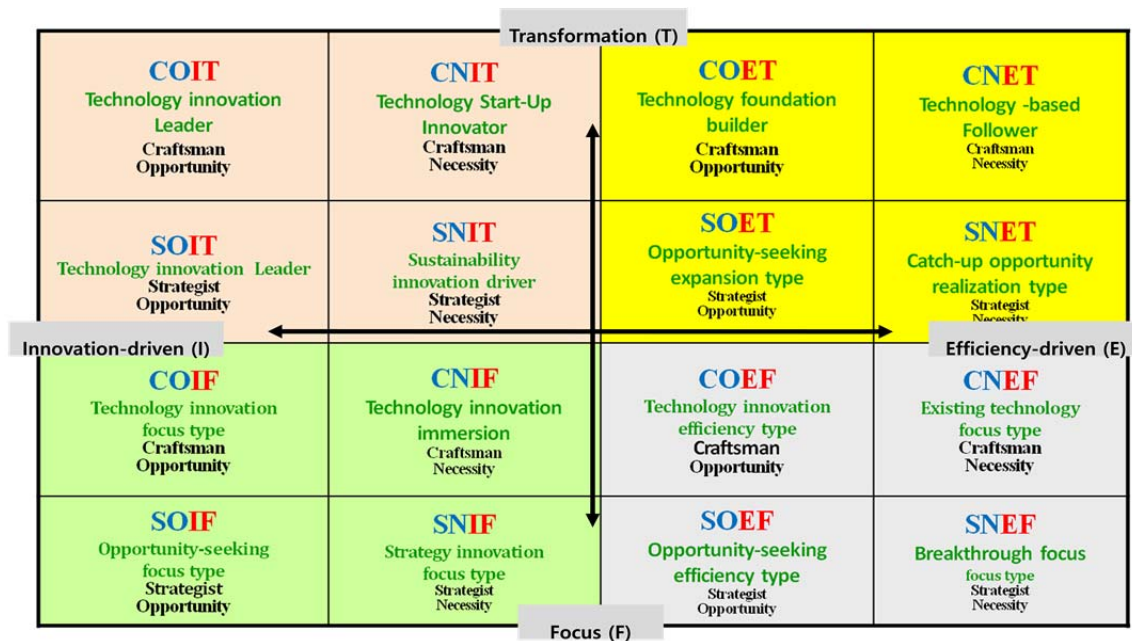


**Source:** Z.-T. Bae, M.-S. Cha, Y. Kim, and J. Lee, "Entrepreneurial Career Stage Models: Case Studies of Successful Role Model Entrepreneurs."*Korean Management Review,* vol. 41, no.1, pp.89-109, 2012.
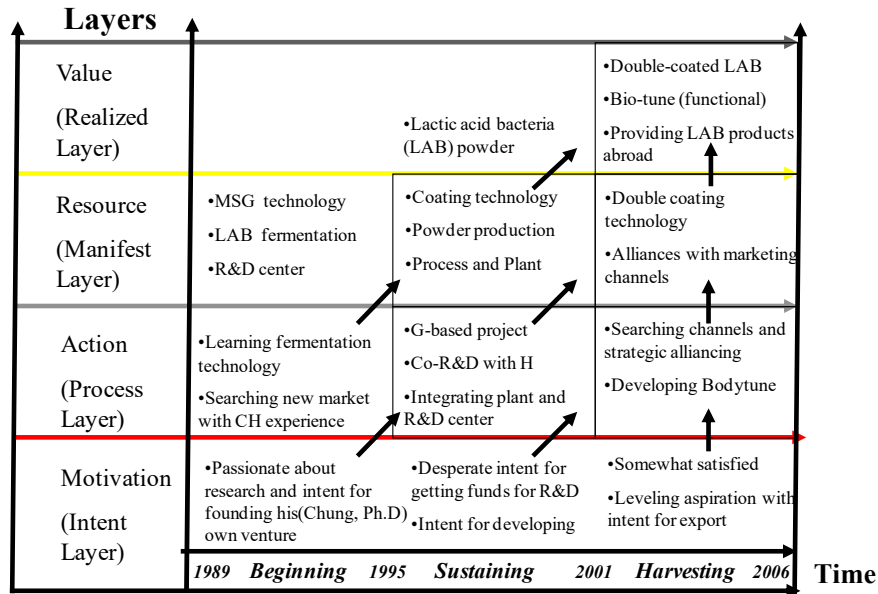
**Figure 1. Entrepreneurial career typology**

2. Interaction of Entrepreneurial Journey: Multiple Layers and Dynamics

The entrepreneurial process has multiple dimensions and complex dynamics so that it could be viewed as a journey or transformational odyssey [2]. The layerity of the process can be defined as micro, meso, and macro levels of the phenomenon. There are at least four layers as shown in the figure 2: Value or opportunity, resource, action, and entrepreneur's mind. This study specifies more sophisticated and adapted layers including habitat which influence on the entrepreneur and the resource process.

**Layers**

| Layers | 1989 Beginning 1995 | Sustaining 2001 | Harvesting 2006 |
|---|---|---|---|
| **Value (Realized Layer)** | | •Lactic acid bacteria (LAB) powder | •Double-coated LAB<br>•Bio-tune (functional)<br>•Providing LAB products abroad |
| **Resource (Manifest Layer)** | •MSG technology<br>•LAB fermentation<br>•R&D center | •Coating technology<br>•Powder production<br>•Process and Plant | •Double coating technology<br>•Alliances with marketing channels |
| **Action (Process Layer)** | •Learning fermentation technology<br>•Searching new market with CH experience | •G-based project<br>•Co-R&D with H<br>•Integrating plant and R&D center | •Searching channels and strategic alliancing<br>•Developing Bodytune |
| **Motivation (Intent Layer)** | •Passionate about research and intent for founding his(Chung, Ph.D) own venture | •Desperate intent for getting funds for R&D<br>•Intent for developing | •Somewhat satisfied<br>•Leveling aspiration with intent for export |

**Time**

Adapted from M.-S. Cha and Z.-T. Bae, "Entrepreneurial journey: Emergence from entrepreneurial intent to opportunity realization," in *Management of Engineering & Technology, 2008. PICMET 2008. Portland International Conference on*, 2008, pp. 777–786.

**Figure 2. Multiple Layered Entrepreneurial Journey**

## III. RESEARCH METHOD

### A. Case Selection and Multi-layered Approaches

PICMET is now annual global conference and center of academic community in the field of Engineering and Technology Management. It serves as a scholarly platform of knowledge creation and dissemination for 25 years. Its biannual rotation of the location with support of many international partners, publication of peer-reviewed proceeding, and department of ETM at the hosting institution are all contributing forces. Technological and organizational innovations and continuous improvement of organizing international conferences are critical viewpoint to shed light on building a model of ACE.

There are three approaches to the ACE model building based on the PICMET case:
1) Ethnographic analysis: This is retrospective, prospective, and prescriptive study- observation, and content analysis of archives.
2) Archival analysis: Sources of materials are mainly www.picmet.org, IEEE, web of science and others.
3) Case interviews: open structured dialogue with volunteers, scholars, founding team members and participant, informal interviews of members.
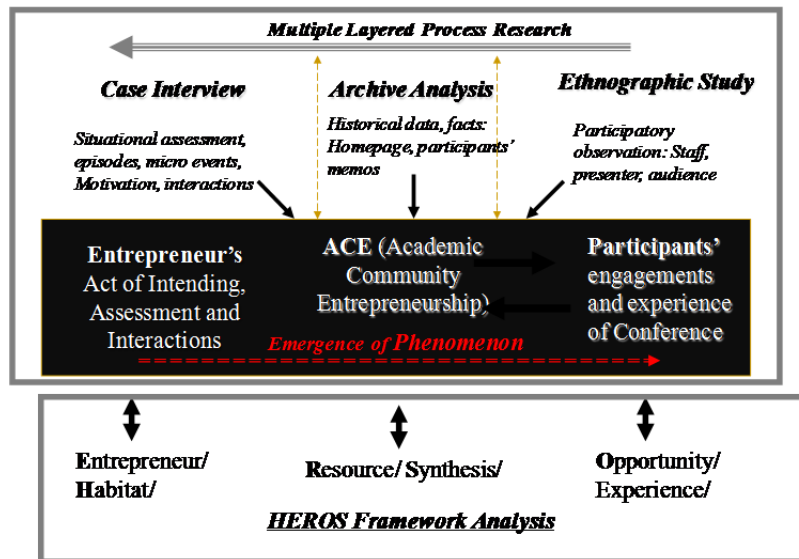
**Figure 3. Multiple-Layered Data Collection**

*B. Model-Theory Building Method*

Case study with qualitative interview and observation with some quantitative/archive DB of IEEExplore [12]. IEEExplore shows the past locations and publications of PICMET. Of course, PICMET homepage was most essential archive of history [13]. The prabook site also keep his career as an objective record of the founder [14]. Below are the main questions to be addressed in the future for better articulation and gauging the impacts. The holistic analysis of key factors based on HEROS frameworks are conducted based on the following method along entrepreneurial stages.

ACE model building is based on multiple methods deals

with dynamic and complex phenomenon and the research practice consists of many factors. Although this paper doesn't include the Gioia method at the initial research stage, the grounded and longitudinal approach with interviewed transcripts give us new concepts [12]. There needs multiple theories to address the complex phenomenon. So the multiple layered approaches are relevant for this study.

The analytic frameworks of stage model have dozens of enquiring questions or assessment items. Basic approaches to the ACE phenomenon of PICMET are based on the following instruments along entrepreneurial stages.
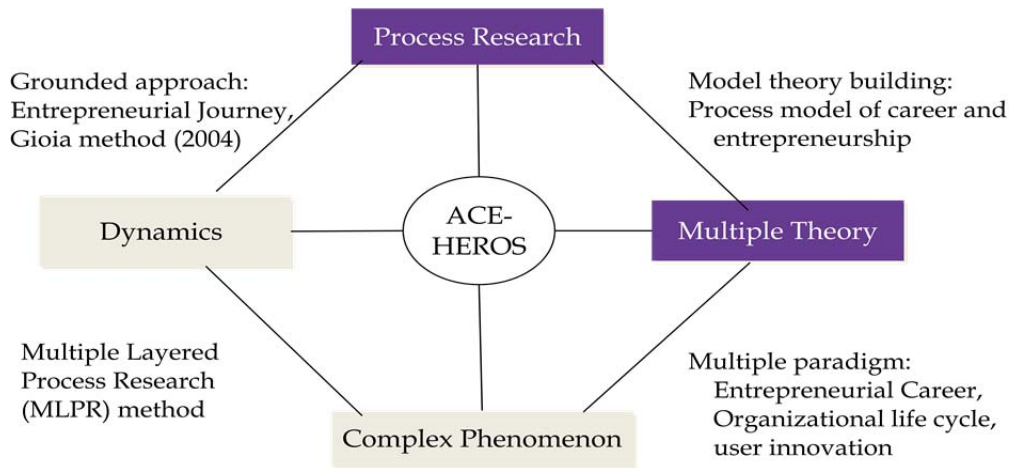


**Figure 4. Holistic approaches of ACE-HEROS model theory building**

TABLE 2. ACADEMIC COMMUNITY ENTREPRENEURIAL STAGES: ASSESSMENT ITEMS

| Stages | Characteristics | Assessment items |
|---|---|---|
| **Ideation**/ Study(Search) | Search for new solution to current obstacles and problem; Learning and Preparation : | ✓ How to getting the idea and intentions of international conference of technology management: e.g. ETM/PSU <br> ✓ How to prepare the conference - Benchmarked conference(s) and academic community: e.g. IEEE |
| **Initiation**/ Startup | Conceiving and intending, and enterprising new vehicle of value creation; | ✓ Networking base: Participation of PICMET initial conference; Invitation of initial community of participants <br> ✓ What makes the PICMET continue: Initial success <br> ✓ Team building: Recruiting and educating new faculty <br> ✓ Prototypical programs and operation with learning by doing |
| **Innovation**/ Success | Delivering newly proposed/ envisioned/ groundbreaking platform and value to the stakeholders; | ✓ Differentiations of PICMET: Leadership, Staffs, Location(s), Procedures, and Sense of Community: e.g. dedication and qualification of founder(s) <br> ✓ Experiments and improvements of PICMETs <br> ✓ Major Breakthroughs and platforms <br> ✓ Key /championing member(s): Faculties, fellows <br> ✓ Engagement and satisfaction of participants <br> ✓ Increase of partnerships |
| **Impact**/ Significance/ | Meaningful changes and contribution to the field of academia and community of practices | ✓ The potential members and actual participants <br> ✓ Papers presented and publication of Proceedings <br> ✓ Participants of the doctoral consortium and growing new professionals in the field <br> ✓ Regional and university contribution |

TABLE 3. ENTREPRENEURIAL CAREER TYPOLOGY [1]

| Stages (4I) | Ideation | Initation | Innovation | Impact |
|---|---|---|---|---|
| Stages (4S) | Study | Start-up | Success | Significance |
| Goal (4P) | Preparedness | Platform | Performance | Philanthropy |
| Activity | • Formation of personality/humanity<br>• Period of education/learning<br>• Prepare by accumulating experience | • Period for recognizing opportunities<br>• Process of preparing for start-up<br>• Period of start-up settlement | • Display leadership<br>• Management principle and strategy<br>• Period for achieving success | • Sustainable growth/Transformation period<br>• Harvest straetgy<br>• Period for realizing social contribution |
| Type 1 | Craftsman | Opportunity | Innovation-driven | Transformation |
| Characteristics | • Directly take part in product/service development<br>• Search for specialty based opportunity<br>• High connectivity between career-company<br>• Possess experience in company related field<br>• Attention concentration to self | • Alternative to start-up exists<br>• Start-up to realize opportunity<br>• Start-up with aggressive motivation<br>• Emphasis on original attempts<br>• Future-oriented approach | • Pursues leading innovation<br>• Emphasis on creativity<br>• Flexibly handle situations<br>• Emphasis on subjective intuition/decision<br>• open-minded decision-making | • Challenge new fields<br>• Pursue new commercial opportunities<br>• Active in social contribution<br>• Flexible goal management<br>• Confront present with future perspective |
| Type 2 | Strategist | Necessity | Efficiency-oriented | Focus |
| Characteristics | • Employ external expert<br>• Search for market based opportunity<br>• Low connectivity between career-company<br>• Lack of company related field experience<br>• Attention concentration to outside self | • Absence of alternative to start-up<br>• Start-up for sustenance<br>• Start-up with passive motivation<br>• Emphasis on existing practices<br>• Focus on breakthrough | • Catch-up as follower<br>• Emphasis on efficiency<br>• Operate strictly according to policy<br>• Emphasis on objective data/decision<br>• Swift decision-making | • Focus on existing field<br>• Develop current commercial opportunity<br>• Passive in social contribution<br>• Clear goal recognition<br>• Prepare future in present perspective |

# IV. ANALYTIC FRAMEWORK OF ACE-HEROS MODEL AND PRELIMINARY ANALYSIS

*A. Habitat : Institution and Ecosystem*

1. External driving force: Environmental, Economy, Academia, Institutional states and changes

a) Inter-organizational factors: IEEE, Informs, IEEE transactions on Engineering Management

b) Incubating, sponsoring institute: Portland state university, PICMET (center)

c) Infrastructure and corporations: Intel, BPA, and other innovative firms

d) Development of Field and demand: Rise of ETM Field after 1970s as educational field

2 External restraining force: Founding environment (Ignorance and indifference)

a) Competition: Existence of other conferences

b) Uncertainty: The lesser attempts have been made, so the response was not sure

c) Institutional Resistance or sponsor: There has been no international conference incubated from Portland state university till now. However, the good will of President of PSU was manifested at the PICMET 1999

3 Linking factors: Partnership of Academic Community

a) Sponsors: STEPI, other regional foundations and University, College (Dean)

b) Scholars and Faculties: Faculties of ETM, Director, Regional representatives

c) Partners/Fellows: 5 continents, more than 30 countries (1991) to 40 countries (1999, 2004).

d) Volunteers and Core team: Ph.D Students have weekly meeting to progress the complex project of international conference with the diverse stakeholders and members.

*B. Entrepreneur(s): Internal driving forces against restraining forces*

1. Entrepreneur's Leadership

a) The length and system of leadership and followership
Since the founding of the PICMET (center) in 1989, the two year cycle of conference (PICMET) was initiated under the founding Chair of ETM at PSU, Dr. Dundar K. Kocaoglu. In 1995, Dr. Anderson joined the team, and Dr. Daim was together when he is Ph.D Student at ETM and as adjunct faculty through the founding process. Dr. Weber and Dr. Jetter joined ETM faculty after they got Ph.D and Best paper award from PICMET. They also serve very important role at PICMET as award director and lead the doctoral consortium respectively.

b) Role Model Entrepreneur: Leader, Dr. Kocaoglu shows many roles. There are several transition in his career, i.e. transition from civil engineer to manager, scholar/researcher to educator, and then academic community leader as editor in chief of IEEE Transaction of Engineering Management (1984-2002), and scholarly entrepreneur as founding president of PICMET (1989-present). During his career as role model educator, engineer, scholar and entrepreneur, he has been a legendary symbol in the field of ETM. Through his executive and symbolic leadership, ETM and PICMET has been ranked world-class community of scholar and practitioner in the field.

TABLE 4. ENTREPRENEURIAL CAREER TYPE: 16 TYPES AND 10 ENTREPRENEURS (C.F. DR. KOCAOGLU: COIT)

| **COIT**<br>(Steve Paul Jobs,<br>Warren Edward Buffett) | **CNIT**<br>(Lawrence E. Page,<br>Sergey Brin) | **COET**<br>(Konosuke Matsushita) | **CNET**<br><br>(None) |
|---|---|---|---|
| **SOIT**<br><br>(None) | **SNIT**<br>(Richard Charles<br>Nicholas Branson) | **SOET**<br>(Masayoshi Son) | **SNET**<br><br>(None) |
| **COIF**<br><br>(Morris Chang) | **CNIF**<br><br>(None) | **COEF**<br><br>(None) | **CNEF**<br><br>(Chuanfu Wang) |
| **SOIF**<br><br>(None) | **SNIF**<br><br>(None) | **SOEF**<br>(Samuel Moore<br>Walton) | **SNEF**<br><br>(None) |

**Source:** Z.-T. Bae, M.-S. Cha, Y. Kim, and J. Lee, "Entrepreneurial Career Stage Models: Case Studies of Successful Role Model Entrepreneurs."*Korean Management Review,* vol. 41, no.1, pp.89-109, 2012.

There are four stages of academic community development, that is 4 I, as well as four stages of academic entrepreneur, that is 4S, entrepreneur's career stages [2]. Dr. Kocaoglu can be seen as COIT type because he start from the scholar and engineer or knowledge worker, and he founded PICMET after he became editor in chief of IEEE transactions on engineering management as well as founding Chair of engineering and management program. That means he didn't initiate the international conference and center for necessity of living. He started new form of platform and programs. Finally, he transform his career from civil engineer, to manager, researcher, educator, and entrepreneur.

## 2. Initiation and Operational Model

As a voluntary staff, a participant, and an observer, the service and experience of PICMET have matured to be very efficient platform for knowledge generation and sharing in the ETM field. To do so, the event has been planned and prepared 1-2 years before the particular event. For example, PICMET as a center was established at 1989, the first event was held 1991. The first international location of PICMET in Seoul, South Korea was prepared since at least two years before the PICMET 2004, though the preparation meeting of voluntary staff was held before the event several months ago. Core team takes roles of execution and the coordination at the front.

a) Planning and preparation every week: Faculty and graduate students are active contributors
b) Operating and coordination of volunteer staffs: Inducement of learning and contribution
c) Preparation and onsite systems and infrastructure: Technical team and web pages
d) Improvement session: There need many functions to make the conference work better.

e) Innovation introduced: New programs, platforms, and process; Organizational/business sustainability could be enhanced by the new attempts.

3. Innovation: Innovation and Transformation to Global Annual Conference
There are many factors that have positively influence on the success of PICMET:
a) Drawing attendee and continuation of participation
b) Getting sponsorship and partnership: PSU, Intel, STEPI, IEEE and etc.
c) Channeling and aligning departmental resources and extensive relations to PICMET
d) Ending as editor-in-chief of IEEE trans. On MET and dedication to PICMET: Take off as International annual conference after the extensive response from PICMET 2004
e) Biennial away and home conference: Distinctive and attractive characteristics
f) Combining the academic and practical scholars and inviting leading scholars as keynote speaker every morning for conference
g) Friendly accommodation of members at the front desk and fine dining with ceremony: community building efforts
h) Additional services such as fine and impressive field trip at the site of conference
i) Efficient and simple user-interface of PICMET webpage with member services.
j) Timely announcement and coordination of PICMET events and process: Invitation, seminars, news, and deadline, and extended deadline, and relevant feedbacks system.

4. Impact: Fulfillment of the Academic and Practical Impacts
As a scholar, the founder and his team could be an

innovator as lead users in the academic community platform. It was initiated as an accidental and temporary attempt of international conference at Management of Engineering and Technology field. There are many kinds of entrepreneurship and the defining characteristics.

a) Accumulated knowledge and applications: There are 20+ years of proceeding. It's huge stock of knowledge and traces of collaboration among members.

b) Application papers and engagement of practitioners: The field application of new methods and practices are extensive but hard to track the effects. This could be a future research agenda to measure the impact of conference in addition to academic journal.

c) Tutorials: Academic and practical forum and workshop are really helpful for the new format. More engaging manner provokes participation of discussion. New relations and ideas are built during the sessions.

d) New theory and practice development and dissemination: There are many theories and practices firstly introduced or advanced through PICMETs (e.g. EJ, TRM and HDM)

e) Defining characteristics of PICMET stems from the friendly and charismatic character of Dr. Kocaoglu and rehearsed staffs to create bright atmosphere. The conference experience in addition to reception, dinners, and field trip create sense of community. For the future, session and layout can be added for the more collaboration among members.

f) Sustaining the success: the benefit enhancement, control of cost factors. As Dr. Kocaoglu said at the ending session of planning PICMET 2016, there are ups and downs every year. The sustaining and improving the conference requires the commitment of the leader and members. Especially the founder had no sabbatical more than 20 years. That is incredible dedication and sacrifice for the conference and ETM department. This makes the significant impact on the consistent improvement of conference experiences.
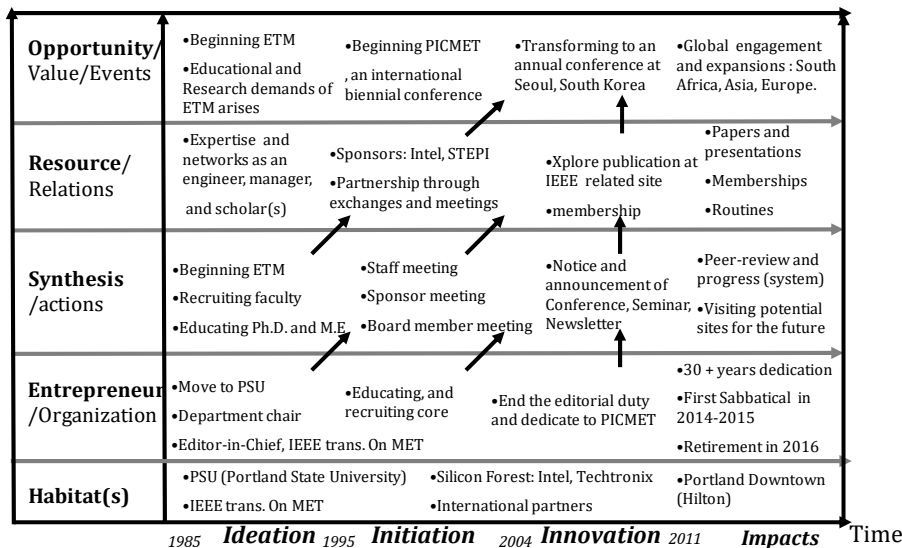
g) Additional improvement and value innovation for the future: New technology and systems are adopted. The organizational design could be changed for the better manner.

h) Impact on the conference sites: The partnership and the engagement of fellows as champion of away conference is definite contribution. At the same time, the sites of conferences have the rewarding effect of revitalization of the field and attracting attention from practical field and national level.

There are many ways to improve the impact of PICMET:

a) Technological side [Platform & Resource] : Emerging technology of mobile and IoT can be utilized in the future. This make the conference smarter and more relevant for the users.

b) User side [Opportunity] : There are more needs at the stage of research, preparation of presentation, delivery, and after-conference follow-up. The professional development tutorial could be added to the doctoral consortium.

c) Human and Financial [Resource]: Current operating team and the old members can be engaged together. Developmental programs to the staffs and members could be vantage point for greater community of scholars.

d) Ecosystem [Habitat]: The industrial sectors like silicon forest at Portland can be common theme for international site for the next conference. Cultural differences should be addressed more to understand each other.

e) Innovation [Synthesis]: Most essential innovation in the future is about member's engagement and collaboration among members. PICMET doesn't have to build platform for them but members would commit more to PICMET with the possible supports.

TABLE 5. PRELIMINARY ANALYSIS: MULTIPLE LAYER MAPPING OF HEROS ALONG 4-I ENTREPRENEURIAL STAGES

| | | | | |
|---|---|---|---|---|
| **Opportunity/** Value/Events | •Beginning ETM  •Educational and Research demands of ETM arises | •Beginning PICMET , an international biennial conference | •Transforming to an annual conference at Seoul, South Korea | •Global engagement and expansions : South Africa, Asia, Europe. |
| **Resource/** Relations | •Expertise and networks as an engineer, manager, and scholar(s) | •Sponsors: Intel, STEPI  •Partnership through exchanges and meetings | •Xplore publication at IEEE related site  •membership | •Papers and presentations  •Memberships  •Routines |
| **Synthesis** /actions | •Beginning ETM  •Recruiting faculty  •Educating Ph.D. and M.E. | •Staff meeting  •Sponsor meeting  •Board member meeting | •Notice and announcement of Conference, Seminar, Newsletter | •Peer-review and progress (system)  •Visiting potential sites for the future |
| **Entrepreneur** /Organization | •Move to PSU  •Department chair  •Editor-in-Chief, IEEE trans. On MET | •Educating, and recruiting core | •End the editorial duty and dedicate to PICMET | •30 + years dedication  •First Sabbatical in 2014-2015  •Retirement in 2016 |
| **Habitat(s)** | •PSU (Portland State University)  •IEEE trans. On MET | •Silicon Forest: Intel, Techtronix  •International partners | •Portland Downtown (Hilton) | |

1985 *Ideation* 1995 *Initiation* 2004 *Innovation* 2011 *Impacts* Time

## X. DISCUSSION AND CONCLUSIONS

It seems as the maturity stage of PICMET to reflect with sounding board for further development. This case study could create new platform and stream of Academic entrepreneurship that initiate and amplify the social innovation. For this study, there need triangulation approaches to from first-person experience and objective data of the historical archives of PICMET: Case study method, ethnographic description, and autobiographical analysis.

As a scholar, the founder and his team could be an innovator as lead users in the academic community platform. It was initiated as an attempt of the entrepreneurial scholar who is also the user of the international conference. In that sense, PICMET could be seen as a professional user innovation that is different from end user innovation. Technological and organizational innovations and continuous improvement of organizing international conferences are critical viewpoint to shed light on building a model of ACE. This research could be extended to other conferences and deepened to other themes like collaborations. It should have practical impacts too, though it's very difficult project. Marriage of practitioner and scholar in PICMET must have been highly impactful in practical sense across industries like energy, healthcare, semiconductor, and IT. It is a life-deserving achievement, so that it is meaningful journey for ETM faculties and practitioner around this globe in this innovation era. Yes, this is meaningful international conference and innovative organization, PICMET and ETM. Both of them have supported each other and support ETM global community as a whole.

This institutions encourages Innovation and vice versa. As an academic community entrepreneur, Dr. Kocaoglu have taken and conducted many leaders' role as a lead scholar, founder, connector, director, editor, recruiter, and educator. So many members view him as a symbol of PICMET and worried about the difficulty of succeeding his roles and meaning in the ETM field. That is very challenging when the leader's charisma and identification of the organization are very strong. The Apple's former leader and founder, Steve Jobs evoked similar concerns on his succession as CEO, though the successor Tim Cook and other C-level managers have sustained the Job's legend. The future and current leaders and directors of PICMET have similar concerns. Actually, the similar succession process have made regarding the editor in chief of IEEE Transactions on Engineering Management in 1985 when Dr. Albert Rubenstein did retire and handed the torch to Dr. Dundar Kocaoglu. The nexus of scholarship can be continued by educating, advising and mentoring the next generation of scholars. The role model scholars have huge impact on the peers, students, and mentees. Following figure shows the impact of role model academic entrepreneur on the mentee and potential scholars as well as indirect influence with symbolic leadership.

ACE model is refined by the HEROS framework of the multiple-layered process. Depicting and explaining of the process of creating new knowledge and its values through inviting, encouraging and collaborating in a newly emerged academic community for three decades. So, ACE-HEROS model includes the entrepreneurial scholar in academia as well as practitioners belonged to communities of practice in the industrial field. The PICMET as a center and an international conference is highly engaging and impactful in various ways. Of course, there are several possibilities for the sustainable prosperity. This research calls for the collective concerns, cares, and commitment to developing more relevant and practical model and management solution in the ETM field. At the same time, this is the response to the call for further input to enhance upcoming PICMETs by Dr. Kocaoglu at the planning session of PICMET 2016 at Hilton, Portland.

How grace it is to have the community innovate itself as lead users in the field. This model could be generalized to study other global research academic community: BCEREC, West Coast Research Symposium, Informs, IEEE, and Academy of Management, and etc.. So this could be called as a GRACE Model (Global Research Academic Community Entrepreneurship). What are the indices of the participation and other impact statistics of PICMET for 25 years? To answer this, we need more endeavor showing the achievement and impact in our field for more than two decades.
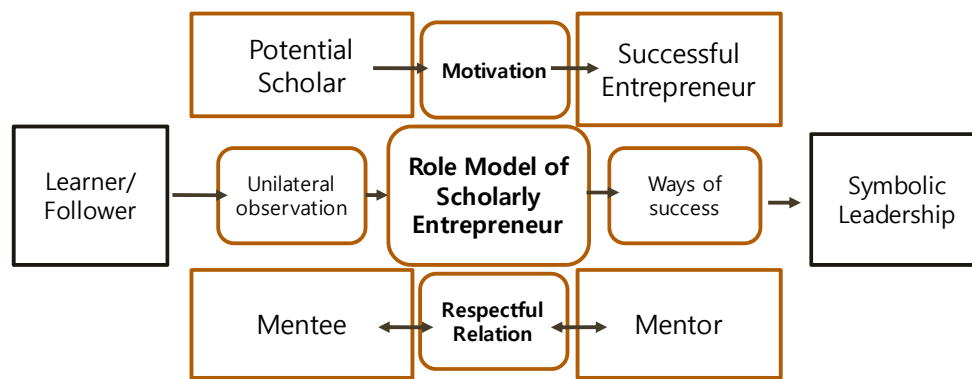


Figure 5. The Role Model of Academic Entrepreneur and Impacts on the Scholars

I hope that the MLPR is developed enough to be applied by other scholars. Moreover, this preliminary case study combining ethnographic and archive study as a staff, participants could spark more ideas and further researches by the member of current and future PICMET. We could share the experience and insights among scholarly and practical members of PICMET community. This is the starting point of archiving and modeling PICMET as role model enterprise of knowledge creation and dissemination. The appendix can be used by members of PICMET to conduct the collective research to develop the ACE model in full scale and scope. Further analysis of PICMET impact could be conducted by social network analysis and impact/trends analysis and simulation of future scenario: Co-work patterns of participants, platform improvement and change. There are huge and wide range of research opportunity regarding engaged scholarship [19], [20], that reaches the realm of entrepreneurship.

## ACKNOWLEDGEMENTS

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APPENDIX. ACE(Academic community entrepreneurship) Model Questionnaire

**Ideation-Search Stage (Since 1960- 1991): Preparation**

1-1)    How were the external/environmental states before starting PICMET? I mean, the support of PICMET from the PSU. There was no record of other international conferences in PSU till now till now. So this is exceptional attempts at the PSU context.

1-2)    Which were the benchmarked conference(s) you participated before PICMET other than IEEE?

1-3)    Compared with the international conference like IEEE, what are the innovative ideas for the PICMET?

1-4)    Why do you think the initial idea are successful (potentially)?

**Initiation-Startup Stage (1991-2003): Striving**

2-1)    How did you get the idea of international conference of technology management?

2-2)    How did you conceive the opportunity and possibility of the first PICMET? Was it necessity or must-do project for you? What was you first guess or expectation?

2-3)    Who are the key members at the preparing the conference? How did you prepare the conference? i.e. What was the initial format of PICMET?

2-4)    Whom did you propose the participation of PICMET initial conference?
(Invitation frame of reference and initial community of PICMET)

2-5)    How were the responses of participants? Why was it so surprising and astonishing? What do you think makes the PICMET continue?

2-7)    What were the successful and failing trials and ideas at the early stage of PICMET? (e.g. community service like paper DB, video recording, reception, field trips, news letter)

2-8)    What were the initial goals and vision? Who were the key members?

2-9)    How did you operate and differentiate PICMET that is distinct to other conferences?

**Innovation/Success Stage (2004-2010): Annualized**

3-1)    What construct the Differentiations of PICMET: Leadership, Staffs, Location(s), Procedures, and Sense of Community?

3-2)    When is the current process/composition stabilized?

3-3)    What was the improvement of every PICMET?

3-4)    What were the major Breakthroughs? - How did it possible?

**Impact/ Significance Stage (2011-Present): 20 years +**

4-1)    Now how much is the potential participants? (trend analysis of participants and papers)

4-2)    How many publication do the participants have in the discipline?

4-3)    How many students have undergone the Doctoral consortium and being a scholar?

4-4)    What is the contribution to regional(Portland) and institutional community(PSU)?

4-5)    Who are the current key/championing member(s)?

4-6)    What is your prospect and plan for the future?

4-7)    What are the academic and practical impacts?

4-8)    How can the progresses of the field can be made?

4-9)    How can you enhance the participation, and collaborations of scholars?

4-10)   What are the impacts of PICMET on MOT field in general? (Once again, I could I get the data, quantifying the impact like submission, participation, presentation, collaboration, publication)