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Regional Development: Four Perspectives of Interactions of Research and Development in University of Applied Sciences

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Abstract: - There are three main statutory tasks for universities of applied sciences in Finland: 1) education; 2) research and development; and 3) regional development. In this continuum of research, the overall research question is: How can the regional development task be understood, designed, defined and actualized in UAS? This question would extend to: 1) what are the characteristics of the dynamic and core capabilities in a region; and 2) how the regional capabilities can be linked to the competences, curriculum, related theories, R&D, and creativity activities in context of UAS. In this study, the research question is: how can the regional development be designed and actualized in perspective or collaborative R&D in the UAS? The used research method is a case study analysis. According to three tasks, UASs should work closely with companies and collaborate with the public sector, regional participants and R&D actors. Then, in the focus, there are development efforts that foster regional development and take into account the structure of a region.

Key-Words: - Case Study Analysis, Curriculum-Integrative Action Process, Integrative Research Framework, Methodology, Networked Expertise

1 Introduction to Theme

There are three statutory tasks for Finnish universities of applied sciences (UAS), these are: 1) education, 2) research and development (R&D); and 3) regional development [23].

It is referenced as backgrounds that, in general sense, UAS and university institutions are valued from a regional development perspective [18, 20]. According to Pirinen, the Integrative Learning Environment's role in the innovation system of its region of operation is related to the existence of a network, activities and systematic participation in that collaborative R&D network [15, 16]. As the word "integrative" in its name indicates it also facilitates the integration of the three statutory tasks in the domain of UAS, region, clusters and innovation system in region [18, 20].

Laurea UAS as an operational environment of study promotes the transformation of regional cooperation networks into innovators by transmitting and producing new knowledge, competence and innovations throughout the national and international innovation system. Then, in this study, the continuum from curriculum through regional R&D agenda to regional, national and international transformations, results and impacts is called to the thematic forum [20].

In this view, the integrative action and learning networks [14] consist of educational and research

institutions, centres of expertise and innovative business organisations [5, 6, 14, 15, 16].

Then, the view of integrative action is defined from the perspective of the nature and being of the work, which regards results and impacts [19]. In addition, the nature of work at UAS is clearly development and service oriented [14]. Following on from that basis, it is evidently, that research methods of integrative studies in this context and perspective are related in the integration of a case studies, service design, design science research and action research. Fig 1 presents this integrative R&D framework [19].

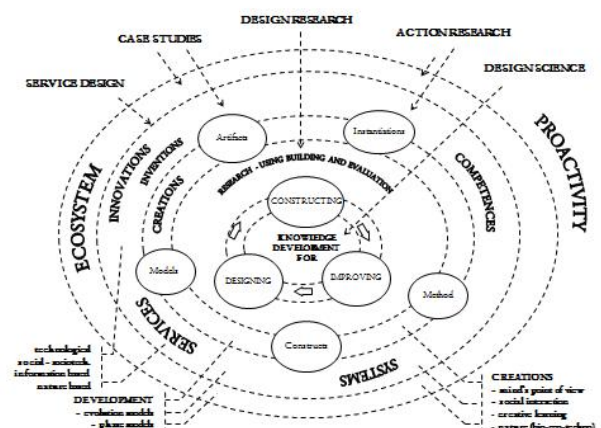


Fig. 1 Integrative R&D framework by Pirinen (2009)

2 Groundwork of Theme

Reference [20] presents the Integrative Action Process model in perspective of regional development. It includes a cycles of interests' integration "idea - design - scope - problem" and "problem - question - r&d - result" [17] as well as drawings of cyclic innovative issues with analysis and consideration of mutable and agile ideas to linear R&D process and agenda in the context of thematic and integrative regional innovation system. This ecosystem was described by Pirinen in [15, 18].

References [1, 3, 5, 6, 17] states the meeting point between an industry and a study unit is significant in terms of continuity and allows students to grow into developers and aids value transformation meaning. Students grow into developers by carrying out an authentic R&D projects and by interacting in competence networks [14]. Once students move on to employment a network becomes a natural meeting place for expertise and the generating of up-to-date information in their expertise sector. An authentic R&D projects allows graduates to cooperate with universities from the workplace. This kind of Value Network naturally defines and specifies their areas of specialisation, which creates dynamic interaction between the employment sector and a UAS. In this view, the Value Networks are concepts to value that "allow investigative minds closer participation". Value Networks can also be used to successfully support innovation efforts. The more grained description of this is included to [18, 20].

According to [18] an industrially driven innovation system is crucial but it has also been empirically demonstrated that innovation is centre based and the promoted objectives and scopes may also be the "co-creative creations of students" and so the supporting of agility in integrative action is necessary and then it must be rationalized because an agility has been clearly an innovation enabler in several reported cases, thus in this reason the co-instructive, co-operative and co-constructive creativity are supported in our Learning by Developing (LbD) culture as described in [14, 15].

Ref. [14] has also discussed the mutual and mutable roles of Finnish universities, UASs, innovation systems, and regional and national development. In particular, it is noted in [15] that the creativity and freedom of innovations have to be supported through lifelong learning because added value is produced if local or global innovation systems are understood and combined with learning processes. The development can be seen as the creation of a system of work distribution where

action in learning first bridges and then forms a body of knowledge for competences. Hence a competence is placed in the first stage of knowledge clusters and in innovation systems, as it has been aided by funding, trust and timing and agility nature in business. Lastly, [15] states noteworthy, that the combining of integrative action and Learning by Developing (LbD) is an intellectual fusion that takes the form of mutual action and learning in an innovation ecosystem.

3 Purpose and Context of Study

The tasks of the UAS described in Finnish law [22] includes: further and higher education that responds to working life and its developmental needs. These tasks are based on research and artistic principles, as well as applied R&D aimed at fostering regional development and taking into account the structure of an area and providing support for individual professional growth. Based on these tasks, UASs link closely to working life and cooperate with regional actors. The integrative process including international and regional development is developed through [14, 15, 16, 17, 18, 19, 20].

Purpose of study: The purpose of this study is to analyze and describe an understanding of actualized R&D processes and their developed concepts as dimensions of general approach to the integration of R&D and regional development in UAS context. In this, the underlined perspective is in regional development and then a new proposition can be seen in light of theory or dimensional approach to integration of regional development and different activities in UAS context. In this, the unit of analysis is *a sample of evidence* and the used form of analysis is described in [4, 7, 8, 11, 13, 22].

Research question: The overall study is continuum of multiple case study research analysis which addresses to the research question: how to understand, design, integrate, and implement the three statutory tasks into everyday action of UAS? The perspective of the overall study is limited to regional development. As research continuum, this particular study inquires: *How can the regional development be designed and actualized in perspective or collaborative R&D in the UAS?*

Context of study: The perspective of study consists of actualizations of master, bachelor and degree education in programmes of: 1) information systems; 2) security management; and 3) services in context of Laurea UAS. In this study, the research findings were drawn and analysis was done between October, 2007 and January, 2012.

4 Setting of Research Method

According to Gerring [8] the term “case” connotes a spatially delimited phenomenon, as a unit, observed at a single point in time or over period of time. Gerring focuses that the case comprises the type of phenomenon that an inference attempts to explain. Each case may provide a single observation or multiple within case observations. Yin [22] states that tentative definition of the unit of analysis which is same as the definition of the case is related to the initial question of case study research and the unit of analysis or the case itself is relevant to the issue and main research questions itself as references to the unit of analysis [4, 7, 8, 22].

Yin [22] states that multiple case studies should follow replication logic and selected cases should serve in a manner similar to multiple experiments, with similar results a literal replication or contrasting results a theoretical replication predicted explicitly at the outset of the investigation. The used replication approach to multiple-case studies is presented in Fig. 2.

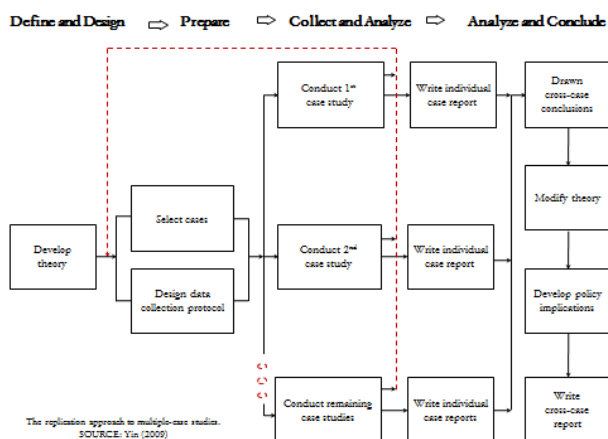


Fig. 2 The replication approach to multiple-case studies

According to Yin [22] a case study is a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence. Yin identifies five components of research design for case studies: 1) a study's questions; 2) its propositions, if any; 3) its unit(s) of analysis; 4) the logic linking the data to the propositions; and 5) the criteria for interpreting the findings [22]. According to Eisenhardt, case study research can be defined as a research strategy which focuses on understanding the dynamics present within single settings [4]. Then, the case study research is said to be suitable for research seeking to answer “how” and “why” questions [22].

Yin continues that the “how” and “why” question in the case study has a distinct advantage when asked about a contemporary set of events and over which the investigator has little or no control to the situation [22]. The research phases of Case Study Research cycle are described by Eisenhardt in [4], by George and Bennett in [7], and Yin [22].

In this, the case study analysis is bringing an understanding of a complex issue or object and can extend experience or add strength to what is already known through previous research. Case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationships, but when the relevant behavior cannot be manipulated. The used analysis in this case study is based on [2, 11, 13, 22].

5 Empirical Context

This chapter introduces the empirical context of this replicative multiple-case study. First, the overviews of the investigated cases are introduced. As phenomenon, the short descriptions of four externally funded and collaborative R&D projects: RIESCA, SATERISK, MayFly, and ORE are presented.

First case RIESCA: Rescuing of Intelligence and Electronic Security Core Applications (October, 2007 to March, 2010). There are a number of systems, such as transport and logistics, power and telecommunication, hydropower and nuclear power stations that are critical to the day-to-day functioning of any technologically advanced society such as Finland. When assessing possible risks, it is only seldom taken into account that power, hydropower and nuclear power plants are critically dependent on the reliability and security of information systems. In consequence, systems that are critical to the proper functioning of society may not work as well as they should. RIESCA aims to offer contributive and constructive, as design-based solutions to this problem.

Second case SATERISK: Risks of Satellites and Satellite Tracking System: The idea to study risks related to satellites was created by students of Laurea UAS in 2008, Viitanen [21] and Ojala [12]. Funding from TEKES (Finnish Funding Agency for Technology and Innovation) was secured on 14.11.2008 and allocated for the period 1.9.2008 to 31.8.2011. The goal of SATERISK is to study the risks connected to satellite tracking and to ascertain if the use of satellite tracking can generate further risks. The project analyses risks using different approaches: legal, technical and mode of use, it will also study potential future requirements and risks.

The SATERISK has expanded into an academic multi-disciplinary collaboration with the University of Lapland, ITMO in St. Petersburg, Russia and the BORDERS network, coordinated by the University of Arizona, USA. In addition, the collaboration was extended with four companies in the field of satellite tracking and government officials such as customs and police in Finland.

Third case MayFly: MayFly is the driver project in field of security and public safety fields. Collaboration: the University of Arizona (USA) and the University of Information Technologies, Mechanics and Optics (ITMO, Russia). R&D is addressed to investigation of novel uses of Micro Air Vehicles (MAVs) for use in the security and public safety fields. MAVs are miniaturized remote-control and/or autonomous air vehicles, which can collect imagery and other information from the air and send it back to ground stations or mobile networks, allowing users to understand and respond to a variety of critical scenarios. The scope of R&D includes developing service models and business cases for a variety of MAV applications, including police, border control, rescue services, customs, and industrial surveillance. The plan of R&D includes a demonstration to test the University of Arizona Dragonfly MAV in Finnish winter conditions.

Fourth case ORE: Open Rendering Environment (June, 2008 to December, 2009). Rendering is the process of generating 3D images and movies on computers. The ORE project aims to bring the Berkeley Open Infrastructure for Network Computing based Big and Ugly Rendering Project distributed rendering service to Finland. This goal was realized by the opening of the "Renderfarm" service in June 2009. The Renderfarm service is the world's first publicly distributed rendering service advocating the use of Creative Commons Licenses. The ORE project also aims to help companies and universities adopt the open source 3D modelling suite Blender into their everyday workflow. While creating new information about social behaviour and distributed computing, Laurea and the project also function as a pilot project for TEKES as it researches the possibility of using Finnish UAS as supporting structures for bringing new technologies into the reach of small and medium enterprises.

6 Research Findings

The research findings gives the viewpoint of the data drawings and results of actualized study units within collaborative and externally funded R&D projects as the described four cases in the perspective of regional development. How can the

duty of regional development [23] be designed and actualized in perspective or collaborative R&D? The presented results focus to the most relevant advantages and benefits of the findings at Laurea between October, 2007 and January 2012.

2.1 Thematic Curriculum

The objectives of the European Higher Education and research on curricula approved out by Finnish higher education institutions led to the adoption of a competence-based curriculum model between 2004 and 2008. The curriculum process was a challenge for the context of this case study as it was a dynamic and changeable process typical in an innovative environment, which could not be completely controlled or planned in advance [17, 20]. The process of case was managed through shared, target-oriented leadership, optimally achieved through the collaboration of various participants and interests. The curriculum model is one of most advanced research finding and crystallization of methodology to conduct regional development in everyday practice of the UAS in perspective of R&D and collaborative activities. The consideration of curriculum was based on five higher education curriculum models, defined in [10] and described in Table 1:

Table 1 Curriculum Models of Higher Education

- 1) The study-unit-based curriculum, in which studies leading to a degree are listed by subject as courses. The internal classification of each subject area is used as the principle for grouping courses together.
- 2) The module model, in which study units are grouped into compulsory or optional modules. Each module forms a cohesive competence area, which must be completed as a whole.
- 3) The competence-based core curriculum, in which modules are not defined as single study units or competence areas, but as core competence modules consisting of various subjects and progression throughout the degree.
- 4) The project-based curriculum, in which generic competences are implemented into functional work entities - projects - for which students achieve concrete outcomes.
- 5) The block model, in which the studies for each semester form a fixed block of studies.

The outcome of the analysis of these models was the 3) competence-based core curriculum, which provides a solution to the practical interaction and collaboration of region, regional capabilities and

every day practice of UAS [15, 16, 17]. In this, the term “thematic” was addressed to the continuum of syllabus-curriculum-regional-national-international relations, which included cooperation, agility, trust, and value in collaboration [1, 3, 5, 6, 20].

2.2 Four Perspectives of Interactions

The thematic curriculum model and syllabuses (designs of actualization) provided a theoretical frame for integrating subjects and actualization of the collaborative R&D in the thematic context e.g. continuum of micro level as syllabus, curriculum and regional R&D interest, to the most macro level as national and international level.

In this, one of the main research drawings, the thematic curriculum model included the four perspectives of general R&D interactions as two bridges: first, a bridge between context (e.g. question as where) and competence field (e.g. what) and the second bridge between methods (e.g. how) and theories (e.g. why). These four perspectives are illustrated in the Propeller Model (known also the Dragsfjärd model) in Fig. 3.

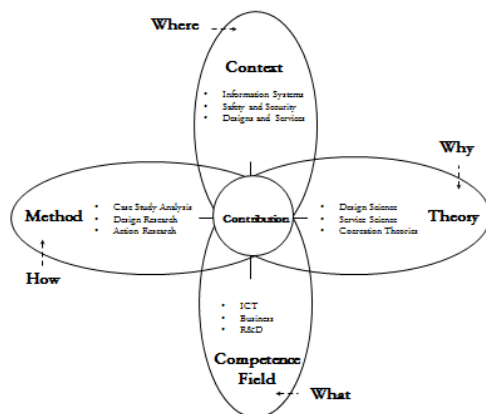


Fig. 3 the Propeller Model in the Context of Study

The foundation: as relations of interactions are drawn from the data collection of study, where action bridges a body of knowledge to competences which can be described in curriculum and syllabus. The second bridge between methods and theories are drawn from the R&D-based actualizations and research. In this union of the four perspectives, a theories and achieved contribution in learning can appear as different instances of the described competences in syllabus. The findings as four forums of interactions are advance in such R&D activities as: 1) curriculum development; 2) composition of proposals and thesis; and 3) perceptions of R&D themes, scopes and agenda in

relations and retentions of regional development processes in network of UASs.

Summary: The dimensions of Propeller Model (Dragsfjärd) are: contribution as in center (outcome), then context (where), competence (what or can actor), theory (why or how can) and a method (how).

2.3 Evaluation Design

The third most focused research finding is that: in light of evaluation and quality, there is no easy and single way of determining validity in collaborative research and development activities as stated in [13]. Based on a findings of all four cases, the future Evaluation Design of R&D actualizations would include both qualitative and quantitative data as which would be interpreted in forms of 1) results, 2) direct impacts, 3) indirect impacts and 4) feedback; this implies that a further R&D of an over region measure instruments and forecasts of proactive regional capabilities are required.

2.4 Triggers and Management Model

The fourth finding addresses to the novel triggers to interaction of R&D and regional development. The grasp of activity would be based on: 1) creations, co-creations, and designs of students, lifelong learners and collaborative R&D participators; 2) objectives of innovation systems as lead innovations, forecast results, and novel problems; and 3) regional-UAS profiles of strategies or forecasted and needed regional capabilities, so that learning is evidence based and collective.

Gibbons [9] states the two coexisting and imperative management modes: 1) “mode-1” which represents “the ideas, methods, values and norms that have grown up to control the diffusion of the Newtonian model of science to more and more fields of enquiry and ensure its compliance with what is considered sound scientific practice”; and “mode-2” meaning “knowledge production carried out in the context of application and marked by its: transdisciplinarity; heterogeneity; organizational heterarchy and transience; social accountability and reflexivity; and quality control which emphasizes context- and user-dependence; the results from the parallel expansion of knowledge”.

6 Conclusion

In this study of the interaction of R&D and regional development in UAS: 1) the first finding addresses to the view to the leadership and management models of higher education institutions and management’s collaboration with other regional

actors. The transformation lays in the understanding of the mode migration by Gibbons [10] from a coordination- and control-oriented leadership mode into an expert-oriented mode: 2) the second finding as the four perspectives of interaction spreads especially such activities as: 1) curriculum development; 2) alignment of proposals and thesis; and 3) awareness of R&D themes, scopes and agenda in relations and retentions of regional development and R&D processes in UASs; 3) the third focused research finding is that: in light of evaluation and quality, there is no easy and single way of determining validity in collaborative research and development activities, since the future Evaluation Design of R&D actualizations would include both qualitative and quantitative data as which would be interpreted in forms of 1) results, 2) direct impacts, 3) indirect impacts and 4) feedback, this implies that a further R&D of “an over region measure instruments” and systematic forecasts of proactive regional capabilities are required; and finally 4) the fourth finding describes the most influenced sources and grasp of novel triggers of R&D activities and presented Gibbons modes as setting of management model in this context.

The Theoretical Kernel:

In this study, the term “interaction” of R&D is understood as a particular way in which a context, competence (substance in [2]), method and theory in R&D affects one other, so joining this touches and relations, a contribution would be achieved.

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