Integrative Action Process in Perspective of the Three Metaphors of Learning

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Abstract— The main contribution of the Integrative Action and Process Model is the creation of a sustainable and linear framework for cyclic innovation activities. The object of integrative action is to continuously integrate the three statutory tasks of universities of applied science in Finland: education, research and development and regional development. The proposed integrative applications and learning practices of integrative implementations of the three tasks were developed, tested and used in master's and bachelor's degree programs in Services, Service Design, Security and ICT at Laurea University of Applied Sciences between 2001 and 2008. Laurea is a research and development-oriented university of applied sciences focusing on service innovations and producing high-quality professional competence. Its specific task is to foster collaboration, international competitiveness and regional development in the Helsinki metropolitan area. The concept of integrative action and the approach and framework of Learning by Developing (LbD) were created as a way for implementing the three tasks in practice within integrative processes, while fostering sustainability and international cooperation with the employment sector. In this study, the focus of implementation of the integrative process is the transformative full duplex usage of cyclic innovation activities and linear development orientations, with quality and relevance as the perspectives of action, where learning is briefly approached through three metaphors of learning: (1) knowledge acquisition, (2) participation, and (3) knowledge creation.

Keywords—education, three metaphors of learning, integrative learning system, transformations.

I. INTRODUCTION

THE STATEMENTS of this case are transformations, lead innovations, supporting creativity in learning, individual and community learning, building know-how through partnership in action, being based on authenticity, experimental nature, and conducting research with international cooperation. There are three main statutory tasks for Finnish universities of applied sciences: education, research and development, and regional development. A design-science and constructive research question for universities of applied sciences are how to integrate these three statutory tasks. The results of this study describe the implemented processes of collaborative and integrative learning concepts and realizations. The concepts and models of the process were tested and integrated into education,

research and development in the learning environment. This study's focus is on the processes of integrative action and their development in the everyday operations of universities of applied sciences [1]. The implementation of the integrative process points to the transformative full duplex usage of cyclic innovation activities [2] and linear development orientations with quality and relevance as the perspectives of action, where learning is briefly approached through three metaphors of learning: (1) knowledge acquisition, (2) participation, and (3) knowledge creation. Each of the metaphors has its distinct focus, theoretical assumptions, and units of analysis. In this applied case there are no clear-cut theoretical and methodological boundaries between these approaches. The three metaphors are not exclusive; all of them are needed to successfully consider learning processes. These metaphors cannot be prioritized from weakest to strongest, because they answer different kinds of questions in order to explain the complexity of human cognition and nature. Fig. 1 gives an introduction to the three perspectives of learning applied in this implementation – learning as knowledge acquisition (the acquisition metaphor) and as participation in a social community (the participation metaphor) – as well as a third aspect – learning (and intelligent activity in general) as knowledge creation (the knowledge-creation metaphor). The focus is on investigating mediated processes of knowledge creation that have become especially important in a knowledge society [10].

Learning in the Integrative Action (three perspectives implemented)

Knowledge Acquisition (1)	Participation (2)	Knowledge creation (3)
knowledge transferring	knowledge sharing	new knowledge creation
process of learning within individual's mind	social activities and practices as bases for learning	new knowledge objects and activities are collaboratively created
based on constructivism	based on socio-constructivism	freedom of methods and support for creativity
process-based	progressive	creative
co-instructive	co-operative	co-constructive
reactive	active	proactive
Element of Processing Nature	Element of Knowledge Sharing Community	Element of Knowledge and Innovation Community

Fig. 1 the three metaphors or perspectives of learning are not exclusive; all of them are necessary and important in applied cases.

II. BACKGROUND

The subject of this study was to create and test a new model and practice for implementing the three metaphors of integrative action in the actualization of the three statutory tasks of Finnish universities of applied sciences (education, research and development, and regional development). A description of the research method and a literature formulation of the perspectives of pedagogy and students' motivation are included.

A. Research Methods

For this case the approach of design-science and constructive research with action research [4] was an obvious choice. The following concepts of constructive research were applied: (1) creation and execution of models, and (2) evaluation of the experimental implementation. The empirical case part, including the design-science research and constructive development and analysis work, and integrating the globalization perspective, was conducted between 2001 and 2008 at Laurea University of Applied Sciences' Espoo, in close cooperation with the Helsinki metropolitan area. The results are based on collected best practices and empirical data from Laurea. Laurea conducts continuous action research of its own processes and has several online databases. Collected data are used for action, research and development purposes.

B. Pedagogical Literature Formulation

The main theoretical background of the learning culture includes a combination of concepts, models, and innovative development theories. It is a pedagogical approach which has constructively and incrementally developed into the present framework of proactive learning called LbD.

Ref. [7] studied innovative learning cycles in teams, using the cultural-historical activity theory and the theory of expansive learning as a framework for analysis. He emphasized the knowledge-creation phase, where problems are first formulated and analyzed. Expansive and innovative learning begins by criticizing, questioning and analyzing existing practices. The focus is on dialectical tensions and contradictions within communal activities. These are usually ignored by approaches that focus on immediate empirical generalizations. The model is to be understood by analyzing more of the elements in an expansive learning cycle, as innovative learning cycles do not follow any fixed order.

Ref. [6] explained the progressive inquiry process with the characteristic autonomy and self-regulation of the learning process. The progressive inquiry process utilizes diversity and the associated "creative chaos" rather than the pre-structured and strictly controlled instructional processes without any degree of freedom. The model captures certain essential aspects of the knowledge-creation process, such as the importance of questions and problems, deliberate work for knowledge advancement, engagement in deepening inquiry, and the socially shared process of inquiry. These are all essential aspects of productively working with knowledge and are routinely practiced within knowledge-intensive organizations.

Refs. [8, 9] are strong advocates of student communities working together to become proficient in fields of knowledge. They introduced the concept of knowledge-building communities, where students learn to work with theoretical and practical concepts as objects. They strongly advocate that students become knowledge-builders and active participants in knowledge-building discourse. The focus is firstly on problems and depth of understanding; secondly on decentralized, open knowledge environments for collective understanding; and thirdly on productive interaction within broadly conceived knowledge-building communities.

In Ref. [10], networked expertise refers to competencies that arise from social interaction, knowledge-sharing, and collective problem-solving, and are embedded in the shared competence of communities and organized groups of experts and professionals. Cognition and intelligent activity are not limited to an individual's mental processes but also rely on socioculturally developed cognitive tools. These tools include physical and conceptual artifacts. Networked expertise is rational. It is constituted in interaction between individuals, communities and larger networks supported by cognitive artifacts. It also co-evolves with continuously transforming innovative knowledge communities. The approach emphasizes the development of expertise, distributed cognition and shared expertise, collaborative and cultural learning, and inquiry-based learning processes.

III. INTEGRATIVE ACTION MODEL

The integrative action [11, 13, 29] builds bridges between technologies and applications, so that research results can be turned into economic success. Innovation alliances are to be made between the various stakeholders, particularly in science, business and politics. In the integrative action model, vertical cooperation will be geared toward certain services, applications and branches with specifically coordinated support contributions from technology areas.

Small and medium-sized enterprises receive special attention in the research program. They play an increasingly important part in value chains as suppliers, and, significantly, are a guarantee for jobs now and in the future. In view of the diversity of individual application clusters and the dynamics of innovation and economic activity, the contents and instruments of public support are tailored to changing requirements.

Individual priorities and projects compete with each other and funds are allocated to those priorities and projects that hold the greatest promise for the set objectives. In this way, new technological priorities are defined and existing priorities revised over the whole duration of the framework program. The definition of priorities thereby closely follows the concept of lead innovations.

Refs. [11, 41] clarify that lead innovations are innovations based on novel technologies which are targeted at value-added chains with great economic potential. The most important features of a lead innovation are:
1) Positive effect on economic growth and employment.

2) Orientation toward value-added chains with high economic potential.
3) Creation of new jobs and strengthening the innovative potential of industry.
4) Enhancing strengths.
5) Conquering new markets.
6) Orientation toward social demands.
7) Networking and clustering of present and future activities.
8) Completed projects and infrastructure.
9) Risk assessment.

In integrative cooperation, "technology alliances" pursue technological objectives created jointly with science and business, together with service platforms. This "lead innovation ecosystem" [28] includes different types of integrative cooperation, actions and activities.

A. Four Elements of Integrative Action

There are several reasons for a clearer specification of the elements of integrative action. The first is the confusion in practical management. A completely different type of management is required for different actions. For example, if relevance-based action processes are managed in the same way as creativity and innovation actions, the result will be chaos; meanwhile, if creativity support is implemented as linear action, the outcome will be either very little innovation or no innovation at all. The second reason is the core idea behind "changing of objectivity" [29], which refers to the balancing of subjectivity and objectivity to support creativity. It explains how and in which parts of the process objectivity and subjectivity are used to support creativity. The third reason is that commercially beneficial innovation is impossible without radical interventions, so cyclic orientation is different from others. The fourth reason is the fact that we live in a time of globalization. While the population's average age rises, the actual population is decreasing in size, which means that future business will focus more on creativity and innovation. The fifth reason is that good quality is important and it also differs between different actions, so the nature of the elements must be analyzed to lead to a quality system that takes creativity and innovation better into account. Based on these reasons, a clearer definition is sorely needed in order to differentiate between and clarify distinct actions. In this case the four elements specified for integrative action are: 1) cyclic; 2) thematic; 3) linear; and 4) relevance.

1) Cyclic Element

The cyclic element emphasizes regional and global support for creativity and innovation. It allows for meaningful "valuable subjectivity-objectivity changes". It integrates different inspirational actors, creative sources and innovation systems, which together make up a "lead innovation ecosystem" [28, 41], i.e. a cooperative center of lead innovations and technology alliances. A triple helix [12] structure is usually linked to innovations, which are: (1) the dynamics of interactions and communications among academia, industry and government produce on themselves and (2) on the social mechanisms of selection, variation and retention responsible for their evolution as sectors.

2) Thematic Element

The thematic element represents a co-creative collector: it produces a full duplex transformation practice for collecting promising activities and issues related to the realities of development; it is an interface for a community of networked experts focused on cyclic activities; it integrates Living Labs [11] that emphasize bringing science and innovation closer to citizens and inspiring interest in them; it makes realizations that represent linear activities; and it regulates the transformation of "innovation dreams" into genuine realization possibilities. In practice, this means a communal perspective and answers what, why and how innovative ideas, artifacts, services and things are possible to implement.

3) Linear Element

The linear element produces specifications and defines the boundaries of objects [15, 16]. It constitutes the development and implementation part in the integrative action process. It is linked to developing and using a large number of methods and standards, including standards of development, quality, service, design, continuity, security and maintenance.

4) Relevance Element

The relevance element means quality and feedback. It answers questions such as: Is our action relevant? Have the necessary quality standards been implemented? What other relevant perspectives should be taken into account? It also creates new starting or action points to process, and includes evaluation, impact and action research perspectives. It represents the potential standardization aspect of global integrative action. The EFQM Excellence model provides the holistic framework around which an organization can assess the use of these tools and standards, and choose the tools required to move forward. The British Quality Foundation and standards such as ISO 9001:2000 provide complementary rather than competing approaches for the case of integrative action [17, 18, 19].

B. Integrative Action Process

The integrative action process [11, 29] is an application used in the best practices of exploratory, creative learning and LbD [3]. The objective was to implement and integrate the three statutory tasks in the context of services, service design, security and ICT in the case of Laurea University of Applied Sciences. The integrative action process is illustrated in Fig. 2.

The main contribution of the integrative action and process model was the creation of a linear development framework for cyclic innovation activities with a quality perspective. The model itself is a liberation process [3] for innovative activities, rather than a process for automatic innovation generation. The innovative learning cycles do not follow any fixed order [7] and the freedom of methods and creativity are emphasized in the innovation orientation [13]. Hence, the nature of the integrative process is supportive rather than managerial in the cyclic and thematic elements, and objective in the linear and relevance elements. In this case, the objective was to develop the help and support construction of innovations and creativity.

This process systematically combines changing orientations and synthetic transformations.

The framework described in the trimming process model has five components: science and innovation (cyclic) (1); collector of co-creative objects, emphasizing full duplex transformation functions (thematic) (2); development (linear) (3); results (relevance) (4); and quality (relevance) (5). The starting point of the implementation process may be any of the components from (1) to (5). The starting point varies and depends on the objectives and perspectives.

1) Science and innovation

The cyclic science and innovation component emphasizes creativity and includes the elements that solidly link research on future information technology, lead innovations and new service generation together. The research ranges from the implementation of fundamental methods and new technologies to the creation of novel applications and services, and their action impact on individuals, the region and society. In this case it also involves service design, innovations and responsibility.

The objectives of service design are planning and organizing people, infrastructure, communication and the material components of a service, in order to improve its quality, the interaction between the service provider and the customers, and the customers' experience.

The science and innovation component produces also a cyclic activity for development objects, object strategies and future programs such as those of the ICT cluster of the Finnish Strategic Centres for Science, Technology and Innovation (ICT SHOK) and other constructions of lead innovation systems.

The science and innovation component emphasizes cooperation in a community of practices built around shared expertise or a new project that the members of the community agree on and for whose future development they take joint responsibility.

2) Collector of co-created objectives

The thematic collector component represents the function of linearization of creative objectives to boundary objects [15, 16] with flexibility for development. There are many suitable and useful development and research methods for cyclic to linear transformation and process realization. The first useful example is the progressive inquiry (PI) model [6]. The PI model describes the elements of expert-like knowledge practices in the form of a cyclic inquiry process, producing synthesis and defined results.

3) Development

The linear development component refers to development methods and cooperation in communities of networked expertise. From the learning perspective, it means expertise that arises from social interaction, knowledge, competence sharing, research and problem-solving related to collective and specific objects. The development component emphasizes cooperation and creating a "learning and developing" culture. It makes it possible to include and use various scientific perspectives and methods of learning by developing and researching in operation and action. Suitable development methods are available for process realization. One example of implemented cases is the rational unified process (RUP). The RUP model's aim is to contribute to the building of resilient systems that can grow and adapt to new needs [20].

4) Results

The process results component is presented from the perspectives of the three tasks of universities of applied
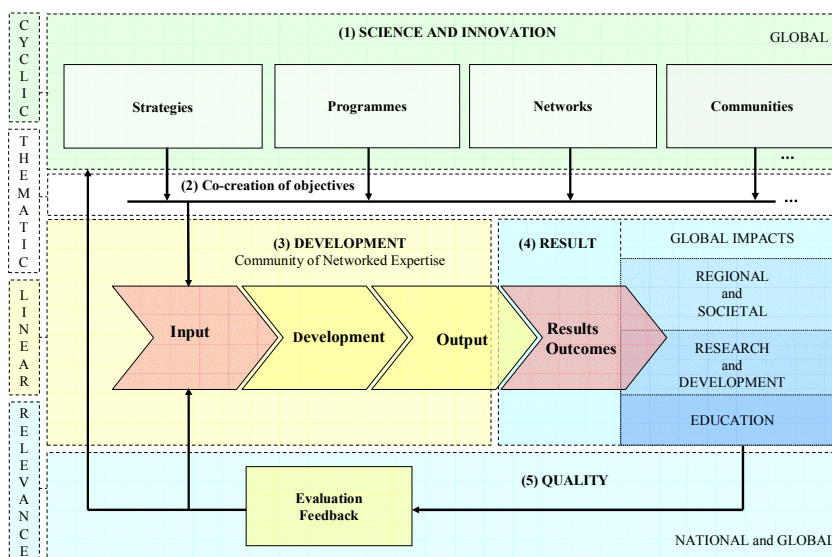

Fig. 2 the Integrative Action Model is the application that is used for best practices of LbD. Its object is to implement and integrate the three statutory tasks in the context of services, service design, security and ICT in the case of Laurea University of Applied Sciences. The Elements with colours are used as full duplex and co-creative interfaces.

sciences, namely (1) education; (2) research and development; and (3) regional and societal development. Results also have increasing effects on globalization, and that is why global impacts 4) are included in the results of the process. The regional development task creates possibilities for value and knowledge transfer to innovations, new services and improvement of productivity, new business and Living Lab environments linked to global markets, vitality of networks, safety improvements, welfare and increased global impact. Regional, societal and global impacts are drivers for the creation of new knowledge. The value and prospects associated with competitiveness underscore the importance of knowledge transfer and its ability to enhance innovations and new services. The impacts of the action model include full duplex transfer between the local and global levels.

5) Quality

The relevance component, (5), includes quality management at the national and global levels. Laurea's Quality Management System (QMS) and quality activities are currently implemented on a local level. The QMS is based on Laurea's values and strategic intent, and on the strategies derived from these. The aim of the system is to systematically produce quality-related data, make functions visible and produce materials for developing operations and processes. The quality management system provides a general view of the links between the different elements of quality development, and identifies the responsibilities of various parties. The system is used to harmonize and increase the efficiency of operations. It provides the context for systematizing functions, while allowing for unit-specific solutions. Laurea's quality documentation describes the management system as a whole, defining the objectives of quality efforts, the organization and the responsibilities of quality and evaluation work. The key quality process of Laurea is development process, and in this case it refers to the quality of the integrative action process [26].

IV. LEARNING PERSPECTIVE

A. Construction of Knowledge and Innovation Community

Ref. [3] proposes the Onion, i.e. the cooperation model for the integration of LbD, regional development work as well as international cooperation and globalization. In the case of Laurea, operations are steered by its strategic intent, which is to be a fully authorized and international university of applied sciences participating in innovative activities. In terms of regional and global development, being "fully authorized" refers to carrying out applied research and development work, and serving regional development in accordance with the quality criteria set for European higher education.

Laurea is an active player in regional development, where the regional development task is linked to the whole education task. In terms of international relations, Laurea enriches its area of operation with international top-level expertise while promoting its internationalization. For learners, the onion model means increased opportunities and increased

international interaction in their studies. Laurea's learners are equal participants in the integrative learning environment development group, which also includes lecturers, partners and researchers. Fig. 3 shows the onion model and its terms. Cluster-based development, cooperation, the components of
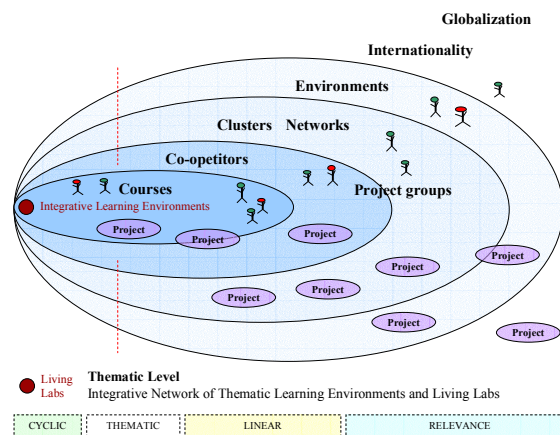

Fig. 3 the Onion Model extends traditional and instructional learning to a culture of Learning by Developing. It is a construction of the paradigm shift from reactive education methods to a culture of proactive knowledge creation through research. Integrative action links Living Labs and institutional integrative learning environments on a thematic level.

the value network and international environments are the core terms in the implemented onion model [11].

In the onion model, the network of integrative learning environments creates an enriching community of knowledge and practice. Innovative researchers emphasize the importance of people's spirit and flow in innovation work. Innovations arise from individuals and their interaction. An "enriching community" means the interactive relationships that link innovative individuals together and to their region. Integrative action joins the onion model and the Living Labs concept to collaboration on a thematic level. The term Living Labs is not yet semantically established, but it represents a general perspective where science and innovation are brought closer to citizens. Ref. [11] proposes co-created and regionally used catheterization terms for Living Labs, involving six levels, namely: (1) the human level, which means neighborhoods or self-organizing virtual Living Labs; (2) the usage level, including test beds and other trial platforms; (3) the thematic level, which involves the collaboration between Living Labs and common interests; (4) the local level, which represents the local innovation service providers' network; (5) the European Network of Living Labs, meaning "Core Lab service in the EU" – in other words, a pan-European platform for providing user-driven innovation capabilities and services; and (6) the global level (Global Living Lab Networks).

In terms of innovation, the applied onion model strengthens the innovation capacity of the area of operation and creates favorable conditions for the birth of innovation. The regional and global development strategy is one of the three main

strategies used to steer operations. Steering takes place in accordance with the management system and the strategic implementation plan. There is an increasing need for complementary development and operation methods, in which the role of integrative learning environments and integrative action matches the development objectives and workers of the employment sector, and the reinforcement of adult education. Complementary development means that the learning environment is an equal participant in and is equally responsible for development projects and their associated economic implications. Integrative learning environments, Living Labs and the LbD model encompass several kinds of innovation spaces and environments that emphasize the transformation and integration of linear and cyclic orientations.

B. Integrating three Metaphors of Learning

LbD is a pedagogical and communal approach in which learning is linked to applied research and development and culture. This means learning expertise that arises from social interaction, knowledge and competence-sharing, researching and problem-solving related to collective objects. The right-hand side of Fig. 4, the "dimension model" [24], emphasizes cooperation and creating a "learning and developing" culture, which makes it possible to include and use various scientific perspectives and methods of learning, research and development in operation and action. The dimension model represents a management and work philosophy based on the production of shared competence and creativity.

Ref [5] proposes that LbD has a learning culture where proactive knowledge development and learning have the following main meanings for the participants and actors:

1) For the learner, it means growing up in a culture focusing on expertise that arises from social interaction, knowledge-sharing and collective development. This implies growing up with the lifestyle of a developer, imbibing proactive learning and personal knowledge management.

2) It means increasing the value of innovations for all cooperators in applied research and development, creating new knowledge, competence, innovations, service products and practices.

3) For the university of applied sciences it means changing its organizational and cultural role towards that of a cooperative community regarding the creation of new knowledge and expertise. This means that the institution's own development process enriches the expertise within the community and increases its role in the value network by being a cultural prime mover and a new actor who shares innovations within the network.

4) The LbD culture contributes to regional development through the learners' interaction in projects, and especially by playing a strong role in creating international links.

In the dimension model, the four layers may rotate in different positions independent to each other during the implementation phases. So the dimension model can be understood by implementing different elements in a learning cycle. The innovative learning cycles do not follow any fixed process order, but cumulative learning is implemented as a whole, covering competences defined in the curriculum and implemented in a syllabus with "no upper limit" [7].

C. Orchestration of Action

The interaction between orientations, including the different transformations, is an important factor in supporting creativity and learning in the innovation system [30]. The example of transformation between problem-based orientation and the culture of creative learning is partially illustrated on the left side of Fig. 4 and Fig. 5. The Orchestration model [30]
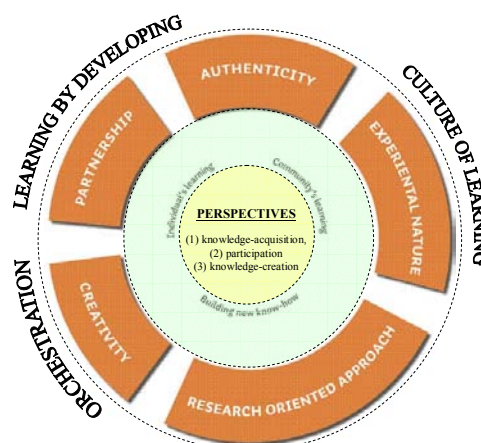

Fig. 4 the left side gives example of full duplex transformation and its variables and the right side illustrates the integrative dimensions of LbD and its three perspectives of learning: knowledge acquisition, participation and knowledge creation. The derivative dimensions of learning are the individual's learning, the community's learning and building new know-how. The impacts of LbD are support for creativity, partnership in action, a basis in authenticity, use of an experimental nature and research with international cooperation. The "dimension model" supports the construction of creativity and innovations, where learning does not follow any fixed process model but the supportive construction of courses brings out the dimensions in complementary ways.

suggests that the existence of innovation orientation and creativity depends on: the nature of objectivity; the types of transformations; the existence of orientation and support for creativity. The term orchestration arises from [27]. A transformation exists between different orientations, and instances of orientations exist simultaneously in the process of creative integrative action.

In the LbD development culture the learning process starts with identifying the initial scope or strategic research object, then perceiving, originating, elaborating, analyzing and describing it, and subsequently selecting the appropriate work methods. The model is not applicable to solving problems set in advance by someone else. Nor does it support the commissioned project principle, because the starting points and objectives are often determined by the cooperating participants of the value network, together with professional developers from research and development organizations. The creative objective of the work is usually not possible to define clearly in advance, but is specified throughout the development process. The process requires critical thought strategies and skills in justifying solutions and evaluating evidence. The work consists of a continuous development process, focusing on research, development and generating new competence in the implementation of the creativity perspective of LbD. The end result is a new creation, a new operating method, a model, a service or a product.

The culture of LbD is linked to different orientations and transformation frameworks. It emphasizes and practices the proactive approach of learning viable new competences. It also combines and incrementally integrates the integrative models of LbD culture and the Onion model.

The LbD Framework model includes model-based, development, research and innovation orientations. The project and problem-based orientations (example in Fig. 4) are included in the transformations between the development and model-based orientations. The curved linking arrows represent full duplex transformation or action. The middle part of the framework consists of LbD's development-based culture. It operates and performs the full duplex transformations between different orientations. The interfaces of the orientations are described as scopes, and the different scopes identified are: creative, development, instruction and research. The scopes are used for rounding transformation functions, where inputs and outputs are described from the direction of LbD to some orientation. The framework model's implementation involves using the integrative action process and onion model in the integrative learning environment and Living Labs. The LbD framework model is illustrated in Fig. 5.

D. Integration of Courses

In the integration model, the themes, topics or scopes do not need to be formally sophisticated; the idea is that the creative object [8, 9], case or scope is interesting and really motivating for the participants. The integration of the framework is
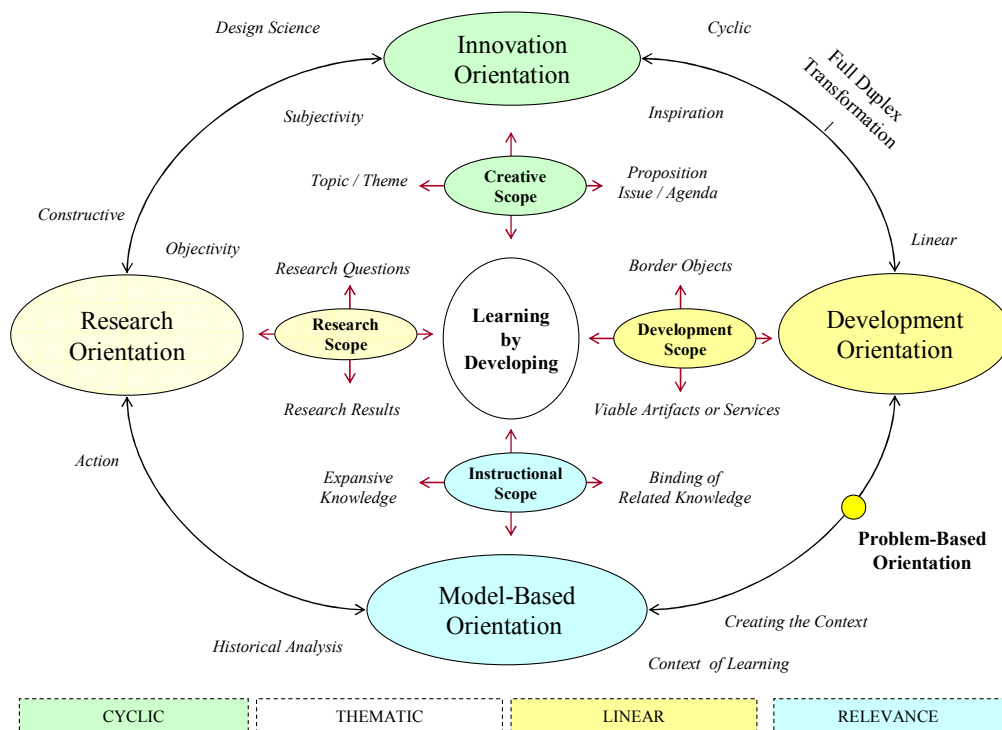
Fig. 5 the framework of Learning by Developing is based on transformations between different orientations. Course implementation use joint, mixed or pure transformation and learning groups select and create different types of topics. The framework model emphasizes using transformations for learning, so from this perspective LbD is transformation-based. The orchestration of transformations and interactions between orientations is performed in the integrative action process. The elements are used on the interfaces of different systems.

designed to facilitate engagement through the building of motivation and trust for participants; in this case, students are equal participants. The participants' competences and own key values and identities must support the object's interest. This means that the participants should be highly motivation for development work. The implementation of integrative action is illustrated in joint Fig. 6.

The starting point of the development project is often the co-creation of ideas, and the findings from contexts are linked to the innovation and creativity object, scope or theme. Trust is crucial in order to build relationships among network participants. If any participants had inadequate personal motivation objects for innovation, the Strategic Centre of Science (SHOK), the European Network of Living Labs (ENoLL) or another lead innovation source briefly discussed objects for such new, active developers. Allowing for the creativity and flexibility of objects is especially important in the "innovation circle", which is an inspirational and cyclic process where spirit and flow play a crucial role. It is illustrated on the right side of Fig. 6. It was necessary for participants to agree that the modified object or case was sufficiently innovative, motivating and worth a personal commitment to development.

At the level of co-creation, the idea, issue, agenda, object and creativity amplify the innovation process. Issues and agendas include object candidates, but an important aspect of the innovation process is that students are equal participants and generate their own creations [10]. In other words, instances of the object or topic guide the students' creativity and innovation, not the teacher's innovation. This is because creativity is the target in learning. Without the participants actively generating ideas, there can be no adequate motivation in the process [6]. Co-creation is mainly a "flexible interface" and "knowledge transfer enabler", rather than a ready-supported construction of the commissioned project. The creative starting points are often evolutionary artifacts by the

cooperators in the value network; lead innovations integrated by the professional developers from research and development organizations. At the societal level, the strategic research objects are also released and carried out in a strategic research agenda (SRA).

In this flexible and enabling way, the integrative action process orchestrates and binds the path for creativity, innovation and the development process, starting from an individual's "key drivers" (interest, competence, motivation, identity, value and trust) and ending in globalization possibilities.

E. Competence-Based Curriculum

It soon became evident after implementing the "learning in projects" model that the traditional curriculum process wasn't optimally supportive of the new operating model. The development objectives of the European Higher Education Area and research on curricula carried out by Finnish higher education institutions led to the adoption of a competence-based curriculum idea and model in 2003-2006. The model's focus is on broader competences needed in the workplace of the future. [42]

In the late 1990s, Laurea chose as its strategic approach the integration of education, research and development, and regional development. A concept of learning and knowledge in line with the strategic intent was recorded in Laurea's pedagogical strategy 2002 and revised in 2007.

According to the strategy, learning at Laurea takes place through instruction, research and development. The principle of triple task integration, approved as Laurea's strategy, was turned into the idea of "learning in projects" in the 1990s and the start of the new millennium. While implementing the pedagogical strategy, Laurea's practical developers refined this principle into the Learning by Developing (LbD) model. LbD combines two of the major orientations of universities of applied sciences: professional education (learning) and research-oriented higher education (developing). [3, 5]
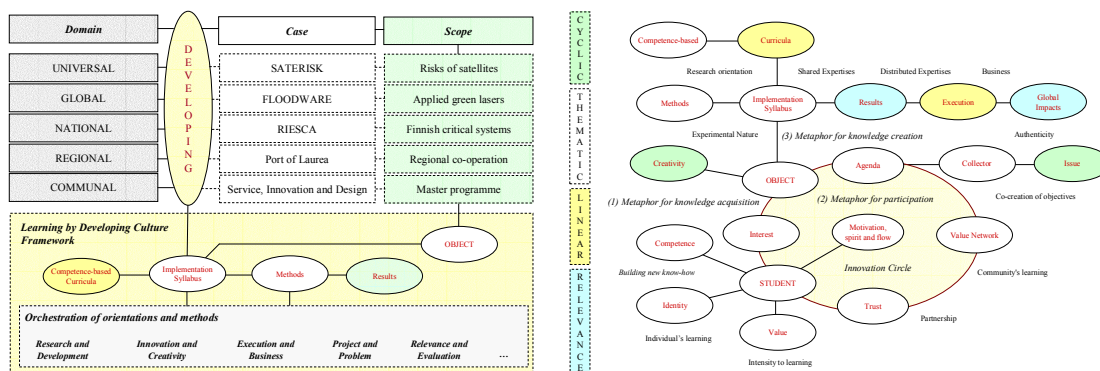

Fig. 6 the implementation of the integrative action model binds the elements with the cases, scopes and implementations of courses (study units). The implementation case model represents terms of action in the form of nouns and connection verbs, and places the dimensions of LbD and the three learning metaphors in the same framework. Reading example: a student is interested in an object and sees the value of the object; this enhances the competence, identity and values of the student and increases motivation and the intensity of learning related bases. It also extends the student's trust, social participation and partnerships within the value network. The elements are connected by colour to the nouns.

An extensive curriculum reform was concluded in 2006, which led to the creation and implementation of a shared competence-based core curriculum for the whole of Laurea in 2006-2008. During the reform, a core curriculum model was created, which produces service innovations and competence, and safeguards and facilitates the fulfillment of strategies. All degree programme curricula were revised according to this jointly created model. The new competence-based curriculum forms an innovative statement on Laurea's behalf, as well as a contribution to the metropolitan area's innovation environment and the development of the European Higher Education Area, in that it allows research and development to be integrated into education.

With the new competence-based core curriculum, Laurea defines itself as a university of applied sciences specializing in service innovations, whose specific task is to foster the competitiveness and regional development of the Helsinki metropolitan area.

A significant crystallization for Laurea's pedagogical thinking was provided by the investigative and exploratory learning model proposed by [6]. This means learning as seen from three perspectives: the information gathering metaphor, the participation metaphor and the knowledge creation metaphor [3]. The exploratory and investigative learning approach has helped to create an understanding of the learner's thought and learning processes in R&D projects, and to create work methods and practices by which R&D skills can be developed in specially formed integrative learning environments [3, 6] and integrative action [29].

The curriculum process was a challenge for the whole of Laurea in that it was a dynamic and changeable process typical of an innovation environment, which could not be completely controlled or planned in advance. The process was managed through shared, target-oriented leadership, optimally achieved through the collaboration of various participants and interests.

The consideration of curriculum is based on five higher education curriculum models, defined in [40]:

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 progressing throughout the degree.

4) The project-based curriculum, in which generic competences are operationalized 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 competence-based core curriculum, which provides a solution to the practical integrative implementation. The coupling of the competence-based curriculum and integrative action is illustrated on the right side of Fig. 6. The competence-base core curriculum is implemented using syllabuses that include archived quality system-related data.

V. CASES

The cases implemented at the Bachelor level took place in Hospitality Management, Security and ICT, and involved 1,120 students. Those at Master's level were in Service Management and ICT, involving 56 students. Currently, there are more than 30 active collaborative projects that use the integrative action model. The selected cases presented below illustrate the types and spread of the cases.

Service, Innovation and Design (SID). The strategic objects are the collaborative development of service innovations and new competences in service design. Laurea is an associate member of the International Service Design Network, which activates the development of new services for the public sector and businesses, arranges various business events, researches and develops innovation networks, and researches the challenges faced by various actors in the course of developing new services [21]. This case was implemented in Hospitality Management and ICT.

Laurea Living Labs (LLL) is a member of the European Network of Living Labs (ENoLL). ENoLL has a Europe-wide platform for providing user-driven innovation capabilities and services to small and medium-sized enterprises, international corporations, public sector agencies, academic institutions and individual citizens. LLL is an approach to stimulating and accelerating industrial and societal innovation. It is also a way of connecting and empowering users to participate in research, development and innovation [22]. This case was implemented in Hospitality Management and ICT.

The case of Rescuing of Intelligence and Electronic Security Core Applications (RIESCA) is targeted to contributing methods for systems that are critical in the national perspective. The research object is to produce information security and continuity management methods that can be used to ensure the proper functioning of critical systems under varying circumstances. Furthermore, it leads to the development of integrative action and an environment for critical system development, management and evaluation. The case uses the integrative action model and its participants include more than ten international companies and three Finnish higher education institutions. The scopes and themes of RIESCA are implemented in several Security and ICT courses. Full duplex knowledge transformation is used with one of Austria's largest independent research centers in the field of software, Software Competence Center Hagenberg (SCCH).

The examples of new security and ICT cases are SATERISK (risks of satellites) and FLOODWARE (flood readiness and research of flood systems), both global, large R&D projects. The integrative action model was implemented

for enabling knowledge creation and globalization of transformations. The idea, foundation, focus, themes, topics and spirit of SATERISK were elaborated by students, so SATERISK is purely a student innovation and creation.

The regional, institutional development and globalization case is LaureaLabs. It is an international expertise cooperation network involving international developers and researchers, which facilitates knowledge transfer and ultimately enables regional development. The network actively involves international trainees who contribute to regional development by generating services and research data in different fields of expertise. It also includes applied R&D projects that contribute innovative and creative solutions to specific problems and needs in companies and industries operating in rapidly changing, knowledge-intensive fields.

The next globalization cases are Port of Laurea and Laurea Village, both of which are used in an international learning concept developed to attract talented Finnish and international students and researchers. The focus is on optimizing existing services and implementing new, necessary services for availability, facilitation and support. Laurea Village aims to combine education, research and development. Communities of networked expertise are cultured from students, researchers and representatives from the employment sector. These communities work in real-life projects to produce knowledge for the academic, public and private sectors in the Helsinki metropolitan area.

VI. RESULTS

The main contribution of the integrative action and process model is the creation of a linear development framework for cyclic innovation activities with a quality perspective. The model itself is more a liberating process for innovative activities than a process that automatically generates innovations. The implemented elements – cyclic, thematic, linear and relevance – clarify the styles of management, the role of objectivity, the special needs of radical innovations, the role of society in the world of globalization, and the contribution and valuation of creativity and innovation measures in a local educational quality system.

The implementation of the integrative action model and the third task in an integrative way is challenging in Laurea's everyday work, because it implies a paradigm shift in education from traditional methods to ones based on knowledge creation through research, development and learning [13, 32]. Building a business that can outlive good ideas, products and services depends on a culture [14] that values learning and supports creativity and radical innovations. If we want to support students' career opportunities, allowing them to grow into responsibilities and trusting in the knowledge expertise community, teachers, participants and managers must learn continuously with them. If the management is not a participant in the integrative action process, action is not effective.

It is important to learn the strong theoretical bases for a broad understanding and for reaching a sustainable base of

knowledge and competences for proactive needs. The important elements of the principles of ICT bases are growing faster than anyone can even read about or imagine them. This integrative action concept motivates theoretical studies using the scaffolding structure [24]. It emphasizes that the best learning arises from an understanding of human nature, the existence of a motivation link and the clustering of the three learning perspectives.

Ref. [25] proposes that if innovation center-based objectives (lead innovations) are used in higher education, learning action creates deeper and more relevant knowledge and competence for expertise communities than a workplace's or student's own themes or interesting areas. This is reasonable because the innovation topics and research areas of innovation centers are deeply verified and analyzed, also from a future perspective. This does not include big contradiction with creativity; it is possible to keep the creative scopes and themes of the innovation center flexible, motivating and creative enough for students in the integrative action process.

Ref. [1] identified challenges including the fact that the system relies hugely on group commitment, motivation and coaching, the difficulty of identifying methods of reaching creative objects and up-to-date knowledge (last known context) systematically, the fact that independent learning takes much longer than coaching (although this could be inevitable genuine development), and deciding the optimum ratio of direct inputs and creative objectives and initiatives.

Higher education institutions can promote knowledge transfer through their international operations. This makes the greater Helsinki metropolitan area a genuinely international and multicultural innovation environment that has strong functional links to other top innovation regions in the world, as well as strategic alliances with top international universities. The region endeavors to form an international community by setting up internationally attractive and innovative R&D projects and institutionalizing effective operating models for innovation. Learners at all levels of higher education are usually seeking ways to improve their research and acquire new competences, so an international value network gives them new concrete prospects and possibilities for carrying out their studies in a global perspective.

National evaluations have recognized the innovative learning and future-oriented development of the integrative model. For instance, integrative action and internationalization efforts influenced Laurea's appointment as a centre of excellence in regional development for 2003-2004 and 2006-2007, and as a centre of excellence in education for 2005-2006 and 2007-2008. [23]

The Finnish Higher Education Evaluation Council (FINHEEC) is an independent expert body assisting Finnish universities, universities of applied sciences, and the Ministry of Education in matters relating to evaluation, and thus contributes to improving the quality of higher education. The twelve-member Evaluation Council operates under the auspices of the Ministry of Education.

The model represents a management and work philosophy based on the production of shared competence and creativity. The objectives given in the model – evaluation criteria for the usefulness of competence – may be difficult to define in advance. However, in setting their own targets, learners should know on what and how they will be evaluated in relation to the starting points and objectives of the learning process and to other participants, as they do in traditional evaluation concepts or when using the evaluation methods used by the employment sector for leadership best practices.

The operating model is clear and transparent. As such, it can be adopted favorably by other universities of applied sciences. The structure of the model is also easy to adapt and renew if changes take place, which means that on the one hand it can develop from the inside, and on the other hand it can produce innovations.

The model emphasizes cooperation with the employment sector to learn about the authentic developments and problems encountered at work. These are addressed in the integrative learning environment's research and development work. The model systematically seeks answers to problems whose solutions require new knowledge. The core of the model is formed by object-oriented work, which means that learning focuses on genuine development of the workplace. Learning has a clear objective and takes place through the process of generating new competence.

R&D projects are one way of making learning object-oriented and managing the learning process. Lecturers, learners and employment sector representatives all participate in the integration from their own perspective. The model signifies creative learning based on real life, an investigative approach and encounters.

In the integrative operating model, learners evaluate their own learning procedurally and assume responsibility for its outcomes. The role of lecturers changes in the learning process. Learners consider the pedagogical model to be well-functioning, which indicates that the principles have been integrated into practical work. The success of the model is also reflected in the learners' enthusiasm and motivation, which are indicators of creative and committed work. Evidence shows that although the innovative model is still in its early stages, it has been implemented simultaneously in several fields of study. It is also evident that the model is supported in the integration principles of the management system. This prepares the ground for future strengthening of communal and cultural processes, fostering the organization's broad-based commitment to the chosen model.

VII. DISCUSSION

Integrative action emphasizes the students' motivation; it has an impact on the quality and level of learning as well as on collaborative results and cooperation. The bases of student motivation are documented in literature both from the classroom [33, 34] and from eLearning contexts [35, 36]. However, less attention has been paid to blended learning situations, where eLearning [24] is combined with face-to-face teaching. Although student motivation is an abstract concept that is difficult to measure in any meaningful way [37], various frameworks and metrics have been developed, including a Student Opinion Survey (SOS) [38], which analyzes motivation from the dimensions of importance and effort. However, the SOS does not include the effect component of motivation, i.e. how a person feels about the task. This perspective is described in [39]. Deeper analyses are still required on student motivation in the course implementation part of the process.

An improvement of the process [31] and its relevance element will be necessary in the future. It represents the possible and meaningful standardization element of global integrative action, allowing us to define collaborative platforms for global higher education and integrative action at the relevance level. The standardization of thematic or cyclic elements should border creativity and limit the institution's strategic competition, but cooperation should be furthered on the cooperative service level. Services may create expertise and Living Lab Networks, e.g. using web service technologies. The EFQM Excellence model provides the holistic framework around which an organization can assess its use of these tools and standards and choose those necessary to move it forward. The British Quality Foundation and standards such as ISO 9001: 2000 provide complementary rather than competing approaches for the case of integrative action [17, 18, 19].

One new, unexpected and surprising phenomenon of LbD is that it brings out social findings related to social problems, alienation or drug abuse. This phenomenon is recognized and needs lot of future work.

Although formal research, especially research results and relevant problems, are good starting points of the innovation process, more creativity support, global thinking and transformation from reactive to proactive direction are needed. Innovations could be born without research or even relevant problems, but it always includes inspiration and perspiration – inspiration meaning creativity and perspiration meaning development. They are always needed and must be present before innovation can be introduced to the global markets.

There are three terms present in the innovation orientation, namely: support of creativity; multidimensional transformation; and space with spirit and flow. Learning creativity is linked to an understanding of human nature. Different methods clearly help and contribute to the area of linear orientations, but there is no formal solution for random and cyclic innovation processes. Therefore, a freedom of methods, applications, changing of objectivities, spirit, flow, transformations and trust exists in the world of cyclic innovation orientation, which also includes creative learning.

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