

Analogy between Interdisciplinary and Business Analysts in IT

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Abstract

This paper presents a pragmatic approach to interdisciplinary studies. It argues for large diversity of interdisciplinary endeavors which is reflected in diversity of approaches, domains and characteristics of projects, diversity of broad questions and integrative answers, diversity of interdisciplinary problems and solutions, and diversity of possible research approaches to interdisciplinary studies. It presents lessons learned from a case of proposing interdisciplinary approach for very large IT projects for public administration. This case includes review of interdisciplinary approaches and dimensions which facilitate comparison and selection of proper means for a specific problem at hand. Then, it focuses on a profile of interdisciplinary in analogy to the business analyst working in the area of information technologies. It draws parallels regarding evolution of notions to focus on business analyst, planning interdisciplinary work, conceptual models which can be applied for representing disciplinary knowledge, and specific roles played by both business analysts and interdisciplinary. Finally, it discusses limitations of this analogy as well as its implications for practice.

1. Introduction

Interdisciplinary studies gain increasing popularity in research and practice. One can notice a large diversity of interdisciplinary endeavors which may vary in domain, type, size, number of stakeholders, implications and other characteristics. Interdisciplinary projects appear in pure science, humanities, social and health sciences and problem-solving in practice. They can be related to private investigations, searching for solutions of real problems where any discipline alone doesn't deliver satisfactory solution, or in research ranging from simple knowledge transfers to formation of entirely new interdisciplinary fields of study, e.g. biomedical engineering. With the increasing social impact of applications of information technologies (IT), one can also notice the increasing need of stakeholders from several disciplines in software projects.

In this diversity of interdisciplinary projects and variety of possible approaches, the question from pragmatic perspective is: what is the essence of interdisciplinarity? The answer can be given by motivation why such projects are necessary, which indicates usually for the need for answers or solutions which are not available in a single discipline. It includes also the need for unified theories which cover a broader scope of phenomena. Another answer can be given based on the fact of involving specialists representing knowledge from several disciplines or on requirements for using knowledge from several disciplines (no matter of motivations). Yet another answer can be given according to the activity which is specific to interdisciplinary studies. And this is integration of knowledge. It can appear in answers, solutions, provisional inputs and outcomes, methods for integration, work of integrators, team collaboration, management and related issues, which overall constitute a field of integrative studies.

There are two goals of this paper. The first goal is to contribute to better understanding of interdisciplinary approaches to IT projects by sharing review of interdisciplinary approaches, dimensions and lessons learned from research on interdisciplinary IT projects for public administration. The second goal is to elaborate on analogy between interdisciplinary and business analysts in IT.

A variety of approaches has been proposed in the area of interdisciplinary studies. As they were discovered in different context, they focus on different aspects of interdisciplinary research or practice. Human factors are a part of many approaches, but seldom are in the center of research. They can be found in programs of studies aiming at developing interdisciplinary. Interdisciplinary can be characterized as individuals who are prepared to participate and/or lead interdisciplinary projects. They should have a broader perspective than one discipline as well as knowledge and skills related to

integrative studies. So, when elaborating on analogy between interdisciplinarians and business analysts in IT, we follow the trend of professional development of interdisciplinarians. As a frame of reference regarding business analysis we use IIBA BABOK Guide (International Institute of Business Analysis, 2015). This is a popular handbook for business analysts as it resulted from about ten years of standardization efforts of the community of professionals, followed by professional certification of business analysts. As a representation of the state of the art for interdisciplinary studies, we use results of the review of interdisciplinary approaches presented as realization of the first goal.

The paper is structured as follows. Section 2 is related to the first goal and it describes lessons learned from a case of proposal of interdisciplinary approach for IT projects for public administration. It contains a review of interdisciplinary approaches and indicates for dimensions in order to facilitate their comparison and effective application. Section 3 aims at fulfilling the second goal and it points out selected parallels between interdisciplinarians and business analysts in IT. It discusses also limitations of this analogy, reliability issues as well as implications for practical application. Section 4 draws conclusions.

2. Lessons Learned about Approaches to Interdisciplinary Studies

2.1. Context

These studies were conducted in context of seminars aiming at supporting decision-makers and project managers of very large IT projects for public administration by presenting research results in fields of economics, management and systems engineering. Interdisciplinary approach was the focus and characteristic feature of our contribution.

In the first step (Bobkowska, 2014), we have identified disciplines which are relevant for this kind of projects and proposed a framework for integrating them at high level of abstraction. The disciplines included: Systems Engineering, Business Process Modeling and Re-engineering, User eXperience, Domain Analysis, Project and Program Management, Legal Regulations, Public Administration, Social Communication (Public relations), Social Impact of IT Applications, Integrative studies (IT- Public Administration -Law). As one can see, they are related to IT projects, broad range of issues in public administration and emerging disciplines on the edge of the previous. For each discipline, we have expressed perspective statement and a number of issues which can be addressed to add value to the projects. Regarding the high level integration, we have proposed disciplines which are related to the final products (IT systems) and which are known to decision-makers and project managers. Thus, the framework has utilized first of all the knowledge from Project and Program Management. Other disciplines were connected to extended analysis or design in systems engineering. For example, legal regulation analysis, social analysis, user/citizen analysis extended typical requirements analysis, and they influenced system design extended by User eXperience design for identified groups of users/citizens together with application of public relation results as well as administrative process re-engineering results. In fact, this is the scope of work typical for business analysts extended by impacts from other disciplines.

In the second step (Bobkowska, 2015), we were searching for approaches of integrating knowledge also at lower levels of abstraction. It resulted in a review of available approaches (described briefly in the following sections) together with the dimensions which facilitate comparing them and searching for useful solutions when project managers encounter any interdisciplinary problem to be solved.

2.2. Creativity and Intuitive Integration

Creativity and intuitive approaches are very popular as they are low-cost for entry approaches. The reason to apply them, despite lack of predictability and methodological rigor, can be explained by the fit of these methods to the specifics of integrating knowledge from various disciplines. Intuition and creativity is useful in cases where the problem is unique, and there are: no single correct answer, no precise procedures, no precise verification criteria, and the solution is multidimensional. Further arguments are provided by the results of psychological research on the nonconscious processing of information by the human mind (Lewicki et al., 1992), which show that nonconscious mind has excellent cognitive capabilities. The only problem is that, due to its nature, they elude human control. However, with good understanding the characteristics of nonconscious mind, the process can be

directed in some way. Best practices for applying creative and intuitive methods during knowledge integration include:

- gathering together experts from all relevant disciplines and/or all related knowledge units before beginning intuitive information processing (preparation phase);
- enough time to work with a mind unloaded by other problems – only under such conditions the human mind can generate valuable solutions;
- formulate objective criteria or methods for verifying results – not every result of intuitive processing is correct, and sometimes the feeling of finding a solution is not reliable (a solution is found, but it is not the right solution);
- counteraction to errors resulting from social phenomena, such as egocentrism, overconfidence, and the resulting subjective sense of rightness when someone is objectively wrong.

2.3. Boundary Objects

The issue of integrating usability and software engineering techniques (Bakalis, Folmer and Bosch, 2004) arose in the context of terminological inconsistency, methodological misalignment, and practical difficulties in applying techniques from these disciplines together in IT projects. A solution was proposed using the concept of boundary objects. A boundary object is an abstraction of a shared conceptual space, shared knowledge, common products and assumptions used to integrate and coordinate the activities of individuals or teams with different specializations. It seems that the concept of the boundary object is universal and can be useful for integrating knowledge from other disciplines as well. It corresponds to the dimension of knowledge types in interdisciplinary studies.

From the perspective of boundary objects, one might consider whether a boundary object refers to knowledge shared by experts from two related disciplines or whether it is common knowledge for the entire team. In terms of levels of abstraction, the fundamental issue is the required level of detail of knowledge transferred from an expert to others. That is, whether the entire team should acquire the expert knowledge necessary for collaborative problem solving, or whether a certain abstraction is sufficient to make the expert's results understandable to other project participants. Boundary objects can be classified according to the 3P (People-Process-Product) model. In the category of people, boundary objects are represented by team leaders or individuals trained in both disciplines. In the process category, the boundary object appears as integrated process. Integration elements include collaborative decision-making processes, result validation processes, meetings, brainstorming sessions, and discussions of ideas, procedures, and document content. In the product category, boundary objects are made of various specifications and documents, e.g. interface prototypes, use cases and scenarios, specifications, reports, presentations, and functionality and usability review documentation.

2.4. Meta-Models for Integration

The idea of meta-models is well-known in the field of conceptual modeling (Object Management Group, 2017) and used in order to precisely define model elements. The primary applications of meta-models include understanding what models represent as well as development of data repositories and tools to support modeling. More advanced applications include formal comparison of modeling languages, use of meta-models as a language in meta-tools, and exchange between different tools. But the idea of meta-modeling can be used also in a general meaning. An example of such an application is an earlier concept of meta-informatics (Engelbart, 1992), used to define the structure of categories in organizations to improve their operational efficiency. In this extended sense, meta-modeling can be applied to knowledge integration, as it enables:

- distinguishing categories for understanding, e.g. terminology in a specific discipline,
- comparing different approaches and theories,
- integrating techniques from different disciplines at the meta-model level,
- developing new knowledge structures, e.g. in learning organizations.

Meta-modeling has significant potential for integrating knowledge from different disciplines. Creating meta-models can facilitate identification of categories used by experts of different disciplines. Meta-

modeling can help in comparing competing theories and selecting proper one. It can help in defining shared units of knowledge. Integrated meta-models can help to create common ground when solving interdisciplinary problems. It corresponds to the dimension of meta-knowledge.

2.5. Paradigm Integration in Multi-Paradigm Modeling

Multi-paradigm modeling (Hardebolle and Boulanger, 2009) addresses the need to overcome technological heterogeneity and reason about the global properties of heterogeneous systems. A good example is the integration of technologies in smartphones, which requires the combination of various technologies: power supply, user interaction, data processing, microwave (Bluetooth), voice acquisition, voice compression and decompression, voice amplification, video compression and decompression, radio, and GPS. This is a formal approach that, at the conceptual level, can also be applied to integration of non-technological domains. Integration mechanisms in multi-paradigm modeling include: model transformations at the model and meta-model level; model compositions from different disciplines; model translations between modeling languages; heterogeneous interactions; multi-view and multi-abstraction mechanisms; component-based approaches and their interconnection; and co-simulation. This approach represents meta-knowledge dimension at the advanced technological level.

2.6. Integration in Interdisciplinary Theories

The problem of knowledge integration is recognized as a significant challenge in all fields of interdisciplinary studies including pure science, social sciences, and humanities (Repko, 2008). The following mechanisms for knowledge integration can be applied:

- informal metaphors or analogies,
- building connections between theories, concepts, and disciplines (bridging),
- identifying conflicts between knowledge units and overcoming them by building common ground,
- extending the meaning of an assumption or term from one discipline to others (extension),
- developing a theory to include additional phenomena by adding variables from additional studies, perspectives, disciplines, etc. (theory expansion),
- redefining terms or assumptions to establish a common meaning (redefinition),
- reorganizing through finding common features, redefinitions, and alignments (organization),
- transforming opposing assumptions or propositions into continuous variables that serve as parameters in particular situations (transformation),
- borrowing and transferring knowledge between disciplines (borrowing and transfer).

The goal of using these mechanisms is to integrate insights from appropriate disciplines to the solution of a given problem and to generate an interdisciplinary understanding.

2.7. Interdisciplinary Teams

From the perspective of increasing performance of cross-functional teams (Parker, 2002), the key issue is building and supporting interdisciplinary teams in order to increase probability of their success. These research results are based on interviews with participants of interdisciplinary projects in various industries. The best practice has been identified, including: clear common goals, shared commitment, joint training, a reward system that recognizes contribution to teamwork, empowering the team to make decisions, and explicitly defined rules of working in a team whose members may come from diverse organizational cultures.

In this approach, precise integration techniques are not in the focus. Integration occurs as the collaborative activity, meaning that knowledge is developed and shared by the team which uses both formal and informal methods. This perspective provides valuable insights into the organizational conditions under which knowledge integration occurs successfully.

2.8. Dimensions

The state of the art regarding interdisciplinary approaches should be analyzed in entire its diversity: diversity of approaches, diversity of projects, diversity of integrative questions and answers, diversity

of interdisciplinary problems and solutions, diversity of context of research on interdisciplinary studies, etc. On the other hand we need some categories to compare approaches and select proper interdisciplinary method for a given case. In practice, we must work in multi-dimensional space, which additionally might change in time or in detail or a combination of single aspects forms proper solution. In order to capture categories for analysis, comparison and action in practice, dimensions are a useful concept. They allow to see all the approaches in a big picture. From methodological perspective, they constitute a kind of common ground for the diversity of approaches.

The following dimensions can be distinguished:

- regarding personnel: individual (competencies) and social (team work and culture),
- regarding knowledge: expert knowledge and shared knowledge, as well as the distinction between interface-knowledge and knowledge about categories (meta-knowledge),
- regarding activities: execution and management dimensions,
- sub-dimensions in the execution dimension: creative-intuitive and formal-methodological execution, where methods can be focused on solution delivery or integration alone,
- sub-dimensions in the management dimension, e.g. the selection of appropriate methods and interdisciplinary team management.

2.9. Lessons Learned

To summarize, the following lessons can be learned from this case:

- We need a framework for interdisciplinary studies. It may come from general interdisciplinary methods as well as selected disciplinary methods or structures.
- Interdisciplinary approaches increase complexity of the projects. Apart from typical tasks related to IT projects, one should conduct analysis from perspectives of other disciplines and assess impact of these disciplines on the project. This impact might be of several kinds: a requirement, a task to be performed, a rule for compliance analysis, an artefact to integrate with other artefacts, etc.
- There is a need for representations both at high level of abstraction and detailed levels of abstraction.
- It seems that there are often many possible approaches, and individual experience is one of the factors when selecting framework approach.
- The approaches to interdisciplinary studies come from different backgrounds. Different context of discovery results in focus on different aspects of interdisciplinary studies. In order to facilitate comparison or search for needed methods or artefacts, we have proposed the dimensions and assigned approaches to them with indication of the level of advancement and coverage of issues in a given dimension by a given approach.

3. Interdisciplinary vs. Business Analysts in IT

3.1. Focus on Interdisciplinary

Taking into account the diversity of possible interdisciplinary projects and the variety of possible interdisciplinary approaches (together with the need to apply approaches specific for a given discipline in order to reach the goal), it is reasonable to focus on interdisciplinary who will be able to conduct and manage any type of interdisciplinary project, instead of proposing yet another methodology. Methods, techniques, product templates, rules and fundamentals of interdisciplinary knowledge are also useful, but their role is to provide a kind of toolbox for interdisciplinary for choosing proper means to reach their goals. Additionally, important aspect of such approach is training of interdisciplinary's competencies.

The way of thinking about supporting business analyst in IT evolved also from proposing methods, especially methods in the areas of requirements engineering, systems analysis, business process management, later also project management or business acumen. With growing size of software projects, roles of analysts together with their responsibility for products and tasks were defined (IBM RUP, 2006). The notion of the role gave space for specifying skills necessary for a given role and integrating them within methodology. Professional business analysts found out a large number of

possible roles in practice and resigned from classifying them. In the IIBA BABOK Guide (International Institute of Business Analysis, 2015), business analyst is defined as “any person who performs business analysis tasks described in the BABOK® Guide, no matter their job title or organizational role.” The content of this guide contains key concepts, knowledge areas which collect tasks typical for business analysis, the list of techniques that might be useful for business analysts as well as specification of underlying competencies which “provide a description of the behaviours, characteristics, knowledge, and personal qualities that support the effective practice of business analysis.”

Interdisciplinary also have different positions or responsibilities in interdisciplinary projects. It would be rather difficult to classify them precisely. Thus, this flexibility in definition of interdisciplinary seem to be a good choice. Literature on integrative studies contains description of theories, propositions of an integrative process as well as several detailed findings for validation of interdisciplinary studies. They correspond to knowledge areas, tasks and techniques and can be included in the interdisciplinary’s toolbox. In the handbook on how to become interdisciplinary (Augsburg, 2006), one can also find the lists of competencies and abilities for which interdisciplinary are valued in the job market. Surprisingly, many of them are similar to competencies of business analyst, e.g. ability to think conceptually, ability to identify and solve problems, ability to understand other value systems, ability to evaluate alternatives, ability to decide on a course of action, effective written and oral communication skills, effective team work or ethical sensitivity.

3.2. Interdisciplinary Planning and Monitoring

Project planning is traditionally a part of project managers tasks. However, it has been discovered that due to the complexity and diversity of business analysis as well as the need for understanding directly business analysis situation, it is more effective when plans of business analysis are made by business analysts. All these is done in context of clear split of responsibilities between project managers focusing on process and business analyst focusing on products and its validation, as well as efficient collaboration between these roles especially in case of overlapping issues. IIBA BABOK Guide (International Institute of Business Analysis, 2015) describes the knowledge area called “Business Analysis Planning and Monitoring”, which contains the following tasks: plan business analysis approach, plan stakeholder engagement, plan business analysis governance, plan business analysis information management, and identify business analysis performance improvements.

By analogy, interdisciplinary should also plan and monitor their activities due to complexity and diversity of interdisciplinary projects. They should also collaborate with several stakeholders including project managers. They should be confident about the unique value they bring to the project, i.e. knowledge and skills related to integrative studies. Comparing to business analysts, they have a new challenge related to understanding perspective of each discipline involved and its potential impact on the project together with its limitations. Another challenge of such planning is how to make the best of a given discipline in a given project when integrating the outcomes from all involved disciplines.

Interdisciplinary can use the best practice captured in tasks of business analysts. They can consider several aspects when planning approach to interdisciplinary projects including preference for level of formalism or number of iterations. They can be more disciplined in rational planning of stakeholder engagement together with adequate ways of collaboration and communication of results. They can also pay special attention to effective strategies and satisfactory collaboration with decision-makers. Another interesting aspect to focus on is interdisciplinary information management which makes a space for integration of best practice from business analysis with specifics of interdisciplinary studies. And finally, business analysts are aware that something might go wrong and identify ways of performance improvements in advance. Having them, they can act effectively even when they encounter threats to effective business analysis realisation. This strategy of risk management can be used also by interdisciplinary.

3.3. Conceptual Models of Discipline Knowledge

An important achievement of systems analysis (adopted later by business analysis) has been use of conceptual modelling. This shift of paradigm has led to thinking in terms of concepts which represent useful aspects of the reality or system, instead of words which describe them. It allowed for effective understanding of complex systems. It made also foundations for multi-view representation of the same

system. The specification of OMG UML (Object Management Group, 2017) delivers a standard modelling language for visualizing, specifying, constructing, and documenting artefacts of systems. Depending on needs, several configurations of methods can use OMG UML for system documentation at different levels of abstraction. However, essential feature of all these configurations is consistent model of the system emerging from several diagrams representing the perspectives of systems' functionality, structure, specific aspects of behaviour or other features. For more advanced applications, domain-specific modelling languages can be applied (Kelly S., Tolvanen J-P., 2008).

When considering application of the conceptual modelling in area of interdisciplinary studies, one can notice that theories in disciplines are, in fact, also a kind of conceptual models which represent a perspective of viewing reality. And in similar way, we can steer to one consistent model which has several views represented by different disciplines. For example, in interdisciplinary analysis, one can extend traditional analysis by adding legal perspective, social perspective or user experience perspective. This is consistent with core of meta-informatics concept in its extended application. Regarding modelling languages, some elements of standard modelling languages can be applied as they define universal modelling perspectives such as structure or behaviour, but interdisciplinarian should be flexible for extending them with use of new profiles for theories from other disciplines or even make use of knowledge about defining domain-specific modelling languages. Some concepts, such as goals and scope for systems analysis, and by analogy: values, perspective description and limitations of a given disciplinary approach, might be difficult to capture by modelling, thus a mixture of visual and textual specifications is a good solution. There are also many new challenges, e.g. how to model different kinds of boundary objects. Finally, perfect integration means a consistent multi-view interdisciplinary documentation which fulfils quality criteria of each discipline.

3.4. Interdisciplinarians in Different Roles

Integration of knowledge is essential in interdisciplinary studies. Business analysts work on the edge of issues related to organisation, business processes, system requirements, domain knowledge, related regulations, non-functional requirements and several specific expectations of stakeholders. Although integration of knowledge is not stressed the description of business analysis, business analysts perform integrative tasks in practice.

Thus, the question is what we can learn from business analysts about integration. The most interesting insights are delivered by competencies in the category of interactive skills. This category contains the following competencies: facilitation, leadership and influencing, teamwork, negotiation and conflict resolution, and teaching. There is another category of communication skills with verbal, non-verbal, written communication and listening. And all of them should be interpreted in context of the skill of adaptability for variety of organisations, stakeholders and situations in rapidly changing environments. This means that business analyst should be prepared to play different roles including the roles of leaders, integrators, mediators, team members, experts and facilitators. Regarding the role of integrator, it is good to connect it with the skill of learning. So, the integration made by business analysts is related to learning new knowledge, then transforming it in course of several individual activities as well as team activities, and finally communicating it to stakeholders (teaching) in a meaningful way with use of "the most appropriate visual, verbal, written, and kinesthetic teaching approaches".

The analogy seems quite clear. Interdisciplinarians also should be flexible and adapt to stakeholders who represent different disciplines, projects and situations. They can play similar differentiated roles in projects. They can act according to the same cycle when they work in the role of integrators. They need the same communication and interactive skills as business analysts.

3.5. Limits of the Analogy

The selected analogies described above just indicate for potential use of achievements from business analysis and systems modelling for interdisciplinary studies. In each practical case, one can make their own elaboration, adaptation and creative extension. The strength of such source of knowledge is the best practice from working on complex business analysis for non-trivial cases which was validated and collected by practitioners.

However, although business analysts often work on the edge of different areas, including domain, business and systems, and they must communicate with diversified stakeholders, business analysis does

not contain typical interdisciplinary knowledge which can be found in literature of interdisciplinary studies. Thus, to become interdisciplinarian, one should also get acquainted with the findings described in theory of disciplinary studies as well as several integrative studies (e.g. these described in section 2.)

It is worth to mention possible bias of the author, whose background is in software engineering and business analysis with a few trials to integrate it with concepts from other disciplines including usability and psychological perspective, legal regulations, social aspects and creativity. It is a known fact in interdisciplinary studies, that the approaches we know, seem more intuitive for us, we understand and like them, we value them more than others and we can find more connections and applications for them. In general, one can say that our experience has impact on our perception of usefulness of interdisciplinary methods. As a consequence, participants with different disciplinary background might have different preferences regarding methods and approaches. This is the typical phenomena which makes a problem to overcome in interdisciplinary studied. It has been identified and described in details during the studies on boundary objects (see section 2.3). Thus, in order to make interpretation of these findings more objective, we must admit that, while being quite confident that it works, it is likely that it will not be intuitive and easy for everyone and that other approaches might work as well.

3.6. Implications for Practical Applications

Since we keep in mind pragmatic perspective of IT projects, it is time to raise the question about implication of these finding for practical application.

First of all, it is a good news for business analysts who would like to become interdisciplinarians. The results show that they have solid foundations for participation in interdisciplinary projects. The results also suggest direction for further education and training possibilities regarding specific interdisciplinary issues. They show examples of analogy, its limitations and style of searching for more analogies. Real business analysts like challenges. They are used to learning throughout their professional life. Thus, the extension of their competencies towards interdisciplinarians can be treated as adventure which can enhance their business analysis activities as well as show new perspectives of work as interdisciplinarians.

In case of individuals who do not have background in business analysis, they can use selected elements of business analysis in order to learn and train their interdisciplinary skills. Becoming professional business analyst takes quite a lot of time and requires practical experience in this profession, so this might not be the option for every candidate for interdisciplinarian. However, learning selected methods, both from the area of business analysis and interdisciplinary study, can be rewarded quite quickly in improved performance of interdisciplinary studies. Those who continue learning in a comfortable step-by-step manner for a longer time, are on a good way to becoming more-and-more mature interdisciplinarians.

The next challenge is related to supporting education of interdisciplinarians. Would a kind of body of knowledge of interdisciplinary studies help? How it should be structured? How it could take into account different starting points, different levels of advancement and variants of training? None is born interdisciplinarian. Everyone can become interdisciplinarian with systematic education and training. The way of supporting the education of interdisciplinarians in order to make it more effective, efficient and adapted to given cases, remains for further research.

4. Conclusions

The research described in this paper had the following goals:

1/ to contribute to better understanding of interdisciplinary approaches to IT projects by sharing review of interdisciplinary approaches, dimensions and lessons learned from research on interdisciplinary IT projects for public administration,

2/ to elaborate on analogy between interdisciplinarians and business analysts in IT.

Two kinds of interdisciplinary studies have been applied:

- *common ground* – identification of dimensions of approaches to interdisciplinary studies with the purpose of facilitating analysis, comparison and integrated use of different approaches,

- *analogy* between interdisciplinarians and business analysts.

The review of approaches to interdisciplinary studies contains: intuitive integration of knowledge, boundary objects, conceptual meta-modelling, multi-paradigm modelling, integration of knowledge in integrative studies and research on interdisciplinary teams from the organisational perspective. Each of them has a different context of discovery and makes a unique contribution to general knowledge about interdisciplinary approaches.

The dimensions include: individual vs. social aspects, intuitive vs. formal approaches, different kinds of knowledge in interdisciplinary studies (expert-, shared-, interface- and meta-knowledge), execution vs. management activities, and several tasks including integration, auxiliary tasks and tasks directly related to solution delivery. These dimensions allow not only for capturing diversity of approaches in a big picture, but also might be useful for selection of proper means in specific case of interdisciplinary studies.

The case description, approaches and dimensions show complexity and diversity of real interdisciplinary projects. And this was a starting point for the analogy between interdisciplinarians and business analysts. The following issues were discussed: focus on interdisciplinarian who can select proper methods to problem at hand (instead of proposing yet another method); use of the best practice from business analysis planning and monitoring for interdisciplinary planning and monitoring of specific interdisciplinary projects; analogy between conceptual modelling of one consistent system with several diagrams which are related to perspectives of viewing the system and conceptual description of discipline knowledge and integrating them in one consistent documentation of the project, and similarity between interdisciplinarians and business analysts regarding different roles (including the role of integrator) in interdisciplinary projects together with their skills. These are just examples of analogies and useful concepts which can be transferred from business analysis to formation of interdisciplinarians in the similar style.

The following implications result from the research. Business analysts are well prepared for extending their training towards becoming interdisciplinarians. Individuals without background in business analysis can use selected methods of business analysis for development of the competencies in their interdisciplinary education. The question for further research is how to effectively support education and training of interdisciplinarians.

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