Fachhochschule Dortmund
University of Applied Sciences and Arts

International Research Conference 2015

CONFERENCE PROCEEDINGS – 25-26 June 2015

- International Forum for Researchers, Master and PhD students
- Colleagues from different Faculties and Partner Universities
- Presentation and Discussion of Trends and Research Results
- Several Modules contributing to Project Management

International Research Conference in Dortmund 2015

The International Research Conference at the Dortmund University of Applied Sciences and Arts took place on June 26-27 for the sixth time.

The complete series of conferences is documented and results are available as a wikispace http://internationalresearchdortmund.wikispaces.com/ .

The conference was initiated by the community of the European Master in Project Management – EuroMPM. It is our main tool for giving our master students, our PhD students and our partners from Bilbao, Kaunas, Kiev, Ternopil, the Netherlands, Bochum, Dortmund and many more countries a forum for meeting, presenting new results and thoughts, and discussing future research and cooperation. Meanwhile, also master students and scientists from our sister programme in Embedded Systems engineering and from other faculties and Master's programmes join. The conference was supported by the DAAD Strategic Partnership "European Partnership for Project and Innovation Management (EuroPIM)" which we set up based on the EuroMPM with our partners in Bilbao, Kaunas, Leuven and Trondheim. Furthermore, the new Ruhr Master School (established by the Universities of Applied Sciences in Dortmund, Bochum and Gelsenkirchen) supported the conference. It will be an umbrella for future conferences.

The scope of the conference was again expanded and covered a wide range of topics. A key issue for future projects is the sustainability in all its facets. Sustainability was therefore the common ground for many contributions and a continuous topic in the discussions. It was considered to be the underlying principle in project management, in economics and business, and in technology. The EuroMPM community will focus its research for the coming years on this topic and expects to generate more interesting contributions for future conferences.

This conference has its own spirit and power since the beginning in 2010.

As a new element, the conference was followed by a summer school in Dortmund, starting on June 29th and ending at July 3rd. The summer school was taking some of the topics of the conference and developed them further into new results and new teaching modules. The summer school was organized into the following 3 streams:

- Sustainability in Project Management
- Usability Engineering
- Automotive Software Engineering

In 2015 the conference has 5 sessions:

Session on Sustainable Project Management (Peter Reusch)

- The Sustainable Project Management Maturity Model, Gilbert Silvius, Ron Schipper
- The Sustainable Project Management Canvas, Ron Schipper, Gilbert Silvius
- Review of Research into Sustainability and Project Management, José Ramon Otegi Olaso
- The influence of quality management practices on sustainable operations in the service industry, Rao Aamir Khan, Adnan Mirza

Session on Project Management Competences (Jose Ramon Otegi)

- Knowledge Transfer between Theory and Practice - Relevant for Developing Project Management Competencies, Dorothee Feldmüller
- A Redesign of Project Management Knowledge Fields and a Concept for the Implementation, Peter J. A. Reusch
- Development of Organization Competencies in Project Management, Sergey Bushuyev, Denis Bushuyev, Victoria Rogozinac

Session 1 on Technology (Christian Reimann)

- Comparative Analysis of Approaches to the IT Project Management, Oleksandr Savych
- INKA-Suite 2 – An SDK for eye-tracking enabled real-time web applications, Christian Schlösser, Philipp Schlieker-Steens
- Development of an application on Android for the determination of location through processing, evaluation and advertisement of the angles of inclination from a Shimmer sensor, Michael Georg Niestroj
- Comprehensive Utilization of the AMALTHEA Tool Platform – A Use-Case along with the Parallax Activity Bot, Robert Höttger, Phil Naerdemann, Lukas Krawczyk, Carsten Wolff

Session 1 on Methods & Tools in Project Management (Andre Dechange)

- Practical Implications of the Critical Field Approach, Wolfgang Tysiak
- The Project Scorecard as a Steering Tool for the Implementation of a Modular Design Strategy, Maryna Siakhovich
- Negotiations in Projects – key to success, Werner Wetekamp
- Applying Project Management Methods in Creating a Start-up Business Plan: Case of Blendlee, Jolita Kiznyte, Marcos Welker, André Dechange

Session on Project Management & Organizations (Denis Bushuyev)

- How to shape Project Organization Management?, Peter J. A. Reusch, Viktoriia Pogrebniak
- Application of Creativity to the Project Management with a focus on Organizing Process, Peter J. A. Reusch, Maria Zadnepryanets
- Substantiation of using IPMA OCB as a Basis for Operation and Development of Companies, Volodymyr Galaniuk
- Exposition of the Problem of Creation a Part-Time Employment Center for University Students in Kiev, Ryzhkina Aleksandra

Session 2 on Technology (Anatoly Sachenko)

- e-Government in Palestine: Introducing the G2G Data Exchange Layer, Ala Nusseibeh
- Smart Biogas Power Plants, Carsten Wolff, Jörn Strumberg, Mathias Knirr, Jens Tekampe, Immanuel Först, Christian Hensen, Christian Fortenbacher, Wernfried Schier
- Gamification Fundamentals and State of Research and Development, Marcel Trotzek, Christian Reimann, Elena Vitkauskaite
- Gamification in Enterprise Context, Elena Vitkauskaite

Session 2 on Methods & Tools in Project Management (Victoria Rogozinac)

- How Project Management Offices and Enterprise Project Management Offices can support Sustainability in Projects, Ekomenzoge Metuge
- Forms of Trust and their Interrelations within the Project´s Life Cycle, Iryna Liubyma
- Review of Interaction of Quality Management Methodologies and Concepts During Project Implementation, Nadiia Volygina
- Communication, creativity and culture, Alesia Kunts, Peter J. A. Reusch

We thank all authors for the contributions to the International Research Conference in Dortmund 2015. The contributions are important – as well as the discussions – for the evolution of the community and the growing power to meet the requirements of the future.

Greetings from the flow of strong projects

Peter Reusch and Carsten Wolff

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THE SUSTAINABLE PROJECT MANAGEMENT MATURITY MODEL

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Key words: *Project management, Organizational maturity, Sustainability, Sustainable Project Management.*

Introduction

'Green' or 'sustainable' project management' is identified as one of the most important global project management trends today [1]. Silvius and Schipper [16] identify a growing number of publications that link the concepts of sustainability to project management. It can therefore be concluded, that "the relationship between sustainability and project management is … picking up momentum" [18: xix].
This growing attention for 'Sustainable project management', however, also bears challenges. The concept of sustainability is understood by instinct, but difficult to express in concrete, operational terms [6]. In order to provide a practical tool for the development and integration of sustainability into project management, this paper presents a maturity model that is suitable for both assessing and developing the organizational capability of integrating the concepts of sustainability in projects and project management.

1. Sustainability in project management

An increasing number of publications relate the concepts of sustainability to project management (e.g. [12], [9] and [16]. Silvius et al. [17] observe that studies on the integration of the concepts of sustainability are mostly of an interpretive nature, giving meaning to how the concepts of sustainability could be interpreted in the context of projects, or of a normative nature, prescribing how sustainability should be integrated into projects. Empirical studies, describing how the concepts of sustainability are integrated into projects, are limited. And the ones that were published, for example [2], [5], [15], [11] and [19], typically cover one or multiple descriptive case studies.
Given the fact that the relationship between sustainability and project management is still an emerging field of study [9] these approaches make sense. However, Silvius et al. [17], also recognize the need for more generalizable, probably quantitative, empirical studies, in order to enable the progression of the integration of sustainability into project management.

A logical condition for more quantitative empirical studies is the availability of some kind of instrument that can be used for the assessment and development of the integration of sustainability in projects and project management. A first conceptual starting point for the development of such an instrument are the aspects of sustainability that were found in the analysis of studies on the integration of sustainability in project management [16]. A second conceptual starting point for the development of an assessment instrument, is the concept of an (organizational) maturity model. Maturity models are suitable instruments to assess the implementation of complex concepts and to raise awareness for potential development [8]. They may also provide guidance for action plans and allow organizations to monitor their progress.

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2. Organizational maturity models

In the 1970's, Gibson and Nolan [10] and Crosby [7], first applied the term maturity to indicate organizational capabilities. The popularity of the concept of organizational maturity was especially intensified by the introduction of the Capability Maturity Model (CMM, later CMMi), in the late 1980's [14]. Following the success of this model, a multiplicity of different maturity models have been developed in science and practice [13].
Organizational maturity models can typically be characterized by their 'Levels', 'Domain', 'Dimensions', 'Respondents' and 'Nature' [3].

- 'Levels' refer to the different maturity levels the model recognizes.
- 'Domain' refers to the field of interest that the model assesses to.
- The field of interest logically forms the basis for the specification of 'Dimensions' or criteria with which the model structures the assessment of the field of interest.
- 'Respondents' refers to the target group of respondents for data collection with the maturity model.
- The 'Nature' of a maturity model refers to the purposes of use of the model and typically distinguishes descriptive models, prescriptive models and comparative models [4].

The different aspects, as described above, together form a set of design parameters for the development of a maturity model.

3. Results and Conclusion

Based on the aspects of sustainability derived from the literature on sustainability in project management, and the design parameters of an organizational maturity model, we developed the 'Sustainable Project Management Maturity Model (SPM3). The SPM3 model uses assesses the level (compliant, reactive, proactive or purpose) on which the different indicators of sustainability are integrated in the project. Figure 1 presents the conceptual framework of the SPM3 model.

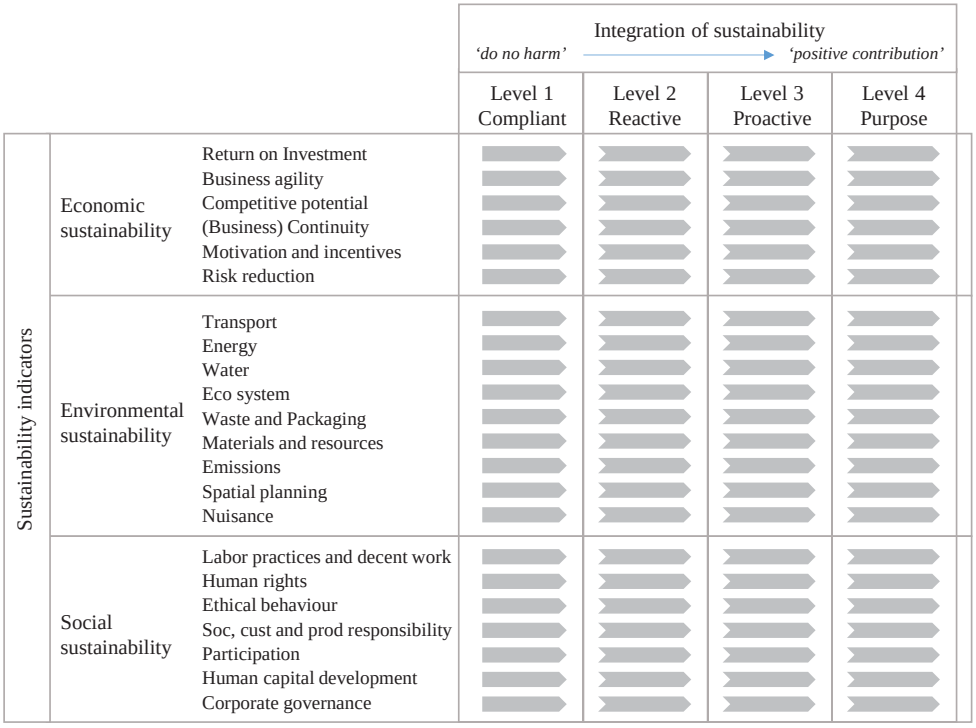

Figure 1. Conceptual framework of the SPM3 model.

The development of the SPM3 model followed the framework for the development of maturity models as found in literature. The design of the model took into account the various publications and standards on indicators of sustainability. In the application of the model, however, the specific variables used in the assessment of the indicators may be tailored to the specifics of the project or organization at hand. SPM3 recognizes four maturity levels, that reflect the various models on the integration of sustainability in business strategies and practices from a reactive 'do no harm' strategy to a proactive 'positive contribution' strategy.
We may therefore conclude that the SPM3 model provides a practical and academically underpinned tool for the integration of the concepts of sustainability into projects and project management.

4. References

[1] Alvarez-Dionisi, L.E., Turner, R. and Mittra, M., 2014: Global project management trends, pre-published paper, retrieved from http://mgoconsultant.com.ar/blog/wp-content/uploads/2014/11/Global-project-management-trends-Final-authors-pre-published-version-3.pdf.

[2] Asad, S. and Khalfan, M.M.A., 2007: Integration of Sustainability Issues within Construction Processes, Emirates Journal for Engineering Research, 12 (2), pp. 11-21.

[3] Batenburg, R., Neppelenbroek, R. and Shahim, A., 2014: A maturity model for governance, risk management and compliance in hospitals, Journal of Hospital Administration, 3(4), pp.43-52.

[4] Becker, J., Knackstedt, R. and Pöppelbuß, J., 2009: Developing Maturity Models for IT Management – A Procedure Model and its Application, Business & Information Systems Engineering (BISE), 1 (3), pp. 213-222.

[5] Bell, S and Morse, S., 2003: Measuring Sustainability Learning from doing, Earthscan, London.

[6] Briassoulis, H., 2001: Sustainable Development and its Indicators: Through a (Planner's) Glass Darkly, Journal of Environmental Planning and Management, 44(3), 409–427.

[7] Crosby, P. B., 1979: Quality is free: The art of making quality certain. McGraw-Hill, New York.

[8] Dinsmore, P.C., 1998: How grown-up is your organization?, PM Network, 12(6), pp. 24-26.

[9] Gareis, R., Heumann, M. and Martinuzzi, A., 2009: Relating sustainable development and project management, IRNOP IX, Berlin.

[10] Gibson, C. F. and Nolan, R. L., 1974: Managing the four stages of EDP growth., Harvard Business Review, 52 (1), pp. 76-88.

[11] Goedknegt, D., 2012: Sustainability in Project Management; A case study at University of Applied Sciences Utrecht, PM World Journal, I(IV).

[12] Labuschagne, C. and Brent, A. C., 2005: Sustainable Project Life Cycle Management: the need to integrate life cycles in the manufacturing sector., International Journal of Project Management, 23(2), 159-168.

[13] Mettler, T. and Rohner, P., 2009: Situational Maturity Models as Instrumental Artifacts for Organizational Design, Proceedings of the DESRIST'09.

[14] Paulk, M. C., Curtis, B., Chrissis, M. B. and Weber, C. V., 1993: Capability maturity model, version 1.1, IEEE Software, 10(4), pp. 18-27.

[15] Silvius, A.J.G. and Nedeski, S., 2011: Sustainability in IS projects; A case study, Communications of the IIMA, 11(4), 1-11.

[16] Silvius, A.J.G. and Schipper, R., 2014: Sustainability in Project Management: A literature review and impact analysis, Social Business, 4(1).

[17] Silvius, A.J.G., Schipper, R. and Nedeski, S., 2013: Sustainability in Project Management: Reality Bites, PM World Journal, II(II).

[18] Silvius A.J.G. and Tharp, J. (Eds.), 2013: Sustainability Integration for Effective Project Management, IGI Global Publishing.

[19] Steele, S., 2013: Drivers for Sustainable Project Management Behaviours in Facilities Management: Fluorescent Tube Business Case Example, in Silvius A.J.G. and Tharp, J. (Eds.), Sustainability Integration for Effective Project Management, IGI Global Publishing, Hershey, PA.

THE SUSTAINABLE PROJECT MANAGEMENT CANVAS

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Key words: *Project management, Sustainability, Sustainable Project Management, Canvas*

Introduction

'Green' or 'sustainable' project management' is identified as one of the most important global project management trends today [1]. Silvius and Schipper [9] and Marcelino-Sádaba [5] identify a growing number of publications that link the concepts of sustainability to project management.
This attention for 'Sustainable project management', however, also comes with practical challenges. Although conceptual understanding is rising, there is a lacking of empirical examples and specifically tailored tools helping a project team with concrete investigation [8]. In order to provide a practical tool for the development and integration of sustainability into project management, this paper presents a Sustainable Project Management Canvas that is suitable for practically helping a project team and its stakeholders integrating the concept of sustainability in an actual project. This is actually a new tool that has never been designed or described before in literature.

1. Sustainability in project management

An increasing number of publications relate the concepts of sustainability to project management (e.g. [2], [3] and [9]. From [9] we can define the core of sustainable project management:

- Having a people/planet/profit perspective in all aspects of the project
- Having a life-cycle perspective on the project, its delivered asset and the products produced with this asset
- Proactively engaging stakeholders
- Taking responsibility for sustainability by the project manager.

Sustainable project management is conceptually well understood. However, only few publication can be found on how this topic can be supported at a practical level for team facing the challenge actually running a project from the sustainability perspective in mind.

2. Tools for sustainable projectmanagement

There's been an substantial and ongoing growth in numbers of sustainable tools and instruments available on the market [4]. In [8] it was discovered that only very few tools are specifically designed for the intersection of sustainability and project management. They identified the following tools with this requirement in mind. Sustainable GWW (www.duurzaamgww.nl) is a Dutch best practice for considering and implementing sustainability aspects of infrastructure projects from the early planning phase of the project, with a focus on the whole life-cycle of the infrastructure object. Another specific sustainable project management tool is the Sustainable Maturity Model from [10]. This maturity model is suitable for both assessing and developing the organizational capability of integrating the

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concepts of sustainability in projects and project management. The Sustainable Footprint Methododology [6] assesses the various social, environmental and economical effects of a project at their project phases to obtain an overall score on sustainability.

Of course these tools have their limitations. The Sustainable GWW tool focusses on the infrastructure domain only. The Sustainable Footprint Methodology maturity model is very knowledgeable and addresses what needs or can be done in a project, but it is less useable on how these needs can be addressed to various project management processes like planning, product work breakdown structure, procurement or stakeholder management. It needs a more expert approach to help a team through the analysis and then translate the results into the various aspects of project management.

When looking for suitable tools, we came upon the Business Model Canvas [7]. This instrument received much attention as a tool for understanding or developing new business models. One of the success factors is the fact that it provides an one page overview of all "containers" and associated questions that basically needs to be addressed. It therefore provides an intuitive picture to talk about within a team performing the task. This concept was translated to the domain of sustainable project management. For the identification of possibilities for sustainability and the way this is addressed within the project we created the sustainable project management canvas.

3. Results and Conclusion

The Sustainable Project Management Canvas consists of three parts. The core part consists of a project management canvas designed with regular containers like `costs, benefits, activities, risks, stakeholders, milestones, deliverables´. The questions although within each container are stated from a triple bottom line and sustainable development perspective. The second part consists of an overview of sustainability indicators and variables from [7] and the update on this model by the same authors to be published in 2015. It consists of 23 indicators and over 80 variables covering all economic, social and environmental aspects. This set is based on both academic and industry accepted resources therefore covering a integrative range of possibilities. This will give the team using the canvas a very clear guidance at the sustainability topics that might need to be taken into account in the project. The third and final part consists of the most important sustainable development concept like circular economy and possible business model for it and life cycle management. This part helps the team in thinking conceptually in the right direction.

4. References

[1] Alvarez-Dionisi, L.E., Turner, R. and Mittra, M., 2014: Global project management trends, pre-published paper, retrieved from http://mgoconsultant.com.ar/blog/wp-content/uploads/2014/11/Global-project-management-trends-Final-authors-pre-published-version-3.pdf.

[2] Gareis, R., Heumann, M. and Martinuzzi, A., 2009: Relating sustainable development and project management, IRNOP IX, Berlin.

[3] Labuschagne, C. and Brent, A. C., 2005: Sustainable Project Life Cycle Management: the need to integrate life cycles in the manufacturing sector., International Journal of Project Management, 23(2), 159-168.

[4] Ligteringen, E., & Zadek, S., 2005: New executive briefing: The future of corporate responsibility codes, standards and frameworks.

[5] Marcelino-Sádaba, S., Pérez-Ezcurdia, A., & González-Jaen, L. F., 2015: Using Project Management as a way to sustainability. From a comprehensive review to a framework definition. *Journal of Cleaner Production*.

[6] Oehlmann, I. "The sustainable footprint methodology." (2011), Lambert Academics, Keulen

[7] Osterwalder, Alexander, and Y. Pigneur, 2011: "Business model canvas." *Self published. Last retrieval May* 5 (2010): 2011.

[8] (Schipper, R., Silvius, A.J.G., 2014: Duurzaam Projectmanagement: De nieuwe realiteit van de projectmanager, Van Haren, Netherlands

[9] Silvius, A.J.G. and Schipper, R., 2014: Sustainability in Project Management: A literature review and impact analysis, Social Business, 4(1).

[10] Silvius, A. G., & Schipper, R., 2010: A maturity model for integrating sustainability in projects and project management. In *24th World Congress of the International Project Management Association*. IPMA Istanbul.

KNOWLEDGE TRANSFER BETWEEN THEORY AND PRACTICE – RELEVANT FOR DEVELOPING PROJECT MANAGEMENT COMPETENCIES AT UNIVERSITIES

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In the following article we adress the process of development of project management competencies based on the concepts of explicit and implicit (tacit) knowledge. We derive appropriate learning forms and give a first analysis of the practice at public universities in Germany.

Key words: *Project management competence, education, theory and practice, explicit and tacit (implicit) knowledge.*

Introduction

The importance of project management is increasing in all business areas and will increase further. Projectification of societies is one trend expected by experts for the next years (see [9], p. 8.). Thus, more education and training of project management competencies for individuals is required, also for students at universities. "Universities, colleges and private companies and associations will provide more education and training for people who are looking for a career within project management." – this is another trend expected by the same study (see [9], p. 11).
Project management competence comprises knowledge and ability respectively theory and practice and is developed by understanding theory, gaining experiences and reflecting them based on different perspectives. This article adresses this process of development of project management competencies and its application to learning and education. Finally we give a first analysis of known practices at German public universities.

We start with a clarification of the concept of competence and the meaning of transfer between theory and practice for competence development. We then describe suitable learning forms for project management education derived from this. This work is part of the research programme "theory meets practice in projects". In this programme, researchers, scientists and practitioners worked together from 2010 to 2013, and thus achieved deeper insights than if they had worked isolated in their traditional fields. There was a final presentation of results on the first IPMA research conference in Berlin 2013 and a resulting publication in [16].

Finally, the learning forms are shortly reflected on practical experiences and best practices collected by the university group of the German project management association and also on an actual research on project management education practices and "not-practices" at German public universities. So we have a first glance at the practices at the German public universities.

1. Competence and Metacompetence

What is competence? On the one side, it is intuitively comprehensible what competence means: someone who is competent may act in a professional way in her or his domain. On the other side, a precise and widely accepted definition of the term is still missing.

When looking at the research of competence, many concepts and a plurality of similar but not consistent definitions exists. Depending on the focus, competence is composed of the following four components: knowledge (knowledge, experience), ability (skills, capabilities, and feature), allowance (responsibility, legitimation) and desire (behavior, motive, willingness, and attitude). This is also the basic understanding used by GPM Deutsche Gesellschaft für Projektmanagement resp. International Project Management Association (IPMA) as presented see e.g. in [10], p. 14.

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A more detailed overview of the discussions concerning the term of "competence" is given by Dimitrova ([5], p. 44). She points out the main characteristics to be:

- Context-sensitive: competences are linked to the context of a certain domain
- Personal: competences are affected by individual experiences and personality traits
- Success-oriented: there is a correlation between competences, professional performance and success
- Action-oriented: competences are shown and described by specific actions
- Learnable and measurable: competences may be learned and evaluated

Competence contains the ability and willingness to cope with new situations in an appropriate way. The key concept suitable for the development and management of a person's competences is the term "metacompetence". Metacompetence is the powerful competence that has the influence on the individual's ability to achieve further capabilities and competences needed in the unpredictable future.

In her work D. Dimitrova [5] studied the concept of metacompetence extensively. With reference to the career research of Briscoe and Hall (see [1]), she defines two components making up metacompetence: adaptability and self-awareness.

- Adaptability: this means a person's ability to identify competences which have a meaning for future success and the ability to develop and enhance these competences in order to be able to master future challenges.
- Self-Awareness: this means a person's ability to pick up feedback relevant for personal development, to build up an adequate self-perception and to modify it if necessary.

Adaptability and self-awareness are both necessary. A person having just a high-level adaptability would behave like a chameleon, adapting his or her color every time something in the environment changes. A person having just a high-level self-awareness would risk to be mentally blocked when perceiving needs she or he can't adapt to. Just the combination of both of them leads to a high-level performance and success.

Remark that one decisive strength of the concept of metacompetence is the fact that metacompetence is not context-sensitive. Metacompetence supports the permanent adaptation of a person's competences to a changing environment (see [5], p. 80, own translation).

2. Competence development – integration of theory and practice

Competence includes knowledge and ability respectively theory and practice. What about theory and practice and their relation?

Theory provides models that are developed to describe elements of the reality, their relations, their actions and reactions. Theory has to introduce and to use an exact terminology and to draw conclusions following defined and logical principles. Different perspectives are shown and discussed elaborately. The models and the conclusions are worked out in order to be universally valid and to make a certain part of reality understandable. This can only be achieved when the distance to the elements of reality is kept by the one dealing with it.

Working in practice is in some respects just the opposite: a person needs involvement for doing a professional job. A person who is competent in a profession has to be able to find a suitable solution for a given problem in a short time. An expert is able to find a solution without thinking and searching for rules for a long time. He just does the right and adequate action, being able to deal with ambiguity and lack of definition. In practice, a generally understandable and broadly accepted solution is more needed than an exact terminology.

A kind of obstacle between theory and practice may be observed. That is what different people call a dissociation between theory and practice:

- There are people who know how to describe situations and required actions, corresponding models and reasonable decisions, but possibly they are not able to act as they describe. "They know what to do but are not able to do so." This is what the Norse cartoonist Olaf Gulbransson calls Eunuch's intelligence (referring to [6], p. 304).

- On the other hand: “When things are proceeding normally, experts don‘t solve problems and don‘t make decisions; they do what normally works.“ ([7], p. 30-31). One key fact in their observations is that real experts act without reflecting rules or theories.
- Neuweg even states that a person may act as an expert without having theoretical knowledge. Getting this knowledge, such a person “possibly just learns to give reasons for actions she or he is able to do without this knowledge” (translated according to [14], p. 22).
- And explicit knowledge may even embarrass fluid professional action: “An anankastic personality wants to act, by knowledge and desire, and then the action looks like being “wanted”, not easy and fluid.” (Frankl, translated according to [13], p. 40).

We like to introduce a picture to describe the relation between theory and practice represented by two parts of the world: two watersides of a lake. The water body is a symbol for the separation. However, the two lakeshores are approaching themselves in terms of distance and they meet at the end. Our presentation of the two worlds of theory and practice and their relation then looks as in Fig. 1:

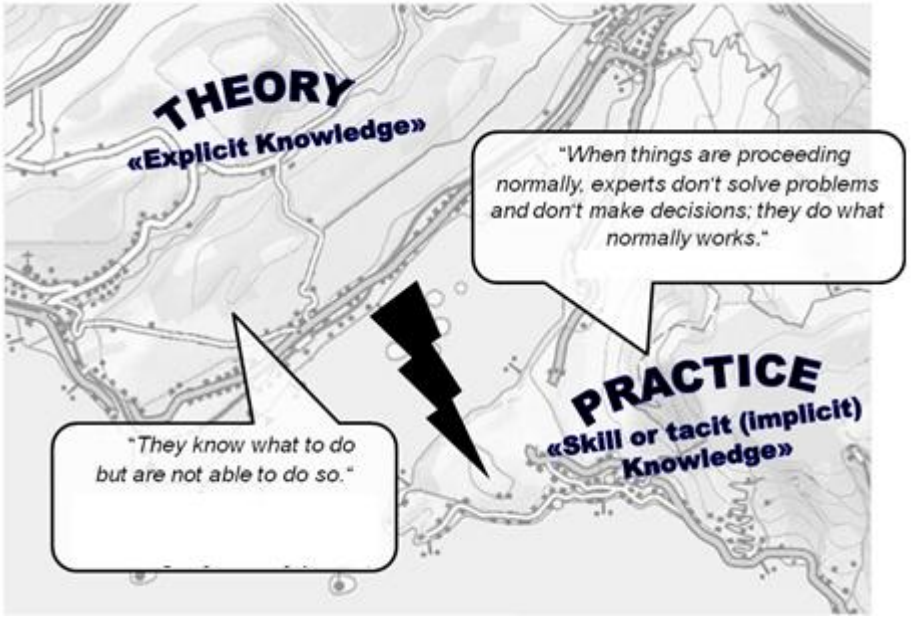

Fig. 1: Dissociation between theory and practice

The dissociation between theoretical knowledge and practical skill has been studied by Polanyi ([15]) and Neuweg ([12]). It may be observed especially in complex situations.

Polanyi and Neuweg - who translates and adapts Polanyi’s work to his community - introduce the terminology of “explicit knowledge” related to “theory” and “tacit (implicit) knowledge” related to “practice” or “skill”.

In this context. a very often cited sentence of Polanyi is “We know more than we can say” ([12], p. 138). When people recognize each other, than they typically use processes where skills are needed that are not explicitly described by rules. This is what Polanyi and Neuweg call “tacit knowing” and “tacit knowledge”. The term tacit stands for the opposite of “explicit”, which can be translated as “implicit”.

The typical attribute of “tacit knowing” is a skill which may not be described by words nor rules. The term “tacit knowledge” means the unconscious use of (implicit) rules. The processes, which are used when a person applies his or her skills, are often unconscious. They depend on experience, unconscious use of memories when perceiving a situation, reasoning and then acting adequately. It’s just the “expert’s eye” which generates an appropriate reaction within parts of a second. Expert skills include actions which are done without analyzing and recombining consciously. The experts’ skills are based on rational rules plus a

large amount of situational experience which has built up to a large tacit knowledge. In addition, rationality is used by experts to gain better understanding of their intuition.

So the two lakesides meeting each other, may represent also the concept of explicit and tacit knowledge. Our understanding of the relation between theory and practice as presented in the figure is:

- Theory and practice are two parts of the world, with different requirements and obstacles in between, but also with explicitly and tacitly well understood overlaps.
- There is practice, which may be explicitly described. But there is also tacit knowledge which is used by experts but it may not or not yet be described.
- Complete understanding is (only) possible by dealing with both theory and practice of a domain.
- Theory is the base for professional action, and it is needed as background knowledge and for reflection of practice.
- For understanding the implicit part of knowledge, social interaction and own practical experience is needed. Also imitation and empathy seem to play an important role for skill development.
- So development of personal skills is only possible by studying theories and gaining in practical experience as shown in the figure – in best case with support of an expert teacher or coach.

The complete understanding of a subject by dealing with both is what Neuweg calls "tour of understanding" or "interplay of analysis and integration" where he means both explicit and implicit integration. On our map, it may be presented as shown in Fig. 2:

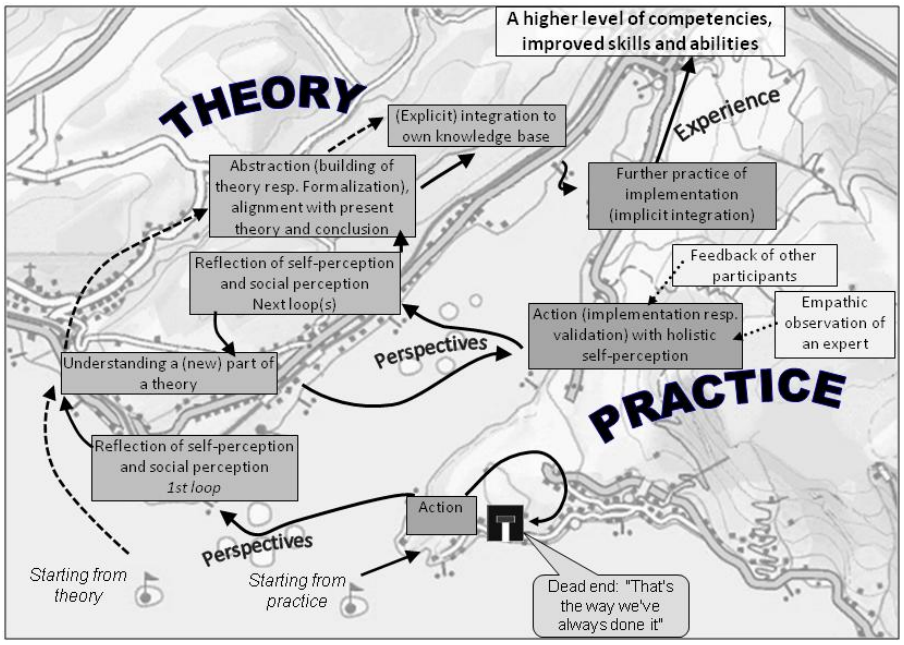

Fig. 2: Development of competence based on theory and practice ("tour of understanding")

Some persons start from practice doing some action. By just doing practical action without reflection, one ends up in a sort of dead end. Things are getting done but there is no further development. The pattern is best described by the sentence "That's the way we've always done it!"

Development is only possible by reflection, using different perspectives, looking for suitable parts of theory, and working on understanding them explicitly and implicitly. This requires not only to apply them in practice but also to repeatedly reflect them.

Practical action has to be made with as holistic self-perception as possible, ideally accompanied with feedback given by other participants. Here, observation and imitation of experts may also be helpful for further development. After several loops of reflection, analysis and abstraction a level of explicit integration

into one's knowledge base is more or less completed and needs further practice. Here, implicit integration takes place and finally leads to a higher level of competences.

Also the link to the term of metacompetence presented above is given: As stated above, the metacompetence of a person correlates with a person's self-awareness and adaptability. In other words, a person who is able to a) reflect her or his demand to learn something, b) to reflect the learning process, and c) to adapt and accomplish the learning with a permanent learning attitude at the same time, has a high level of metacompetence. This person will be able to develop competences in a more effective and efficient way, based on theory, acting adequately in practice. So the concept of metacompetence addresses the same key factors we found relevant for developing explicit and tacit knowledge before. For a more detailed discussion, we refer to [4].

3. Competence development for project management

Applied to project management, the core competence elements are shared, and the concept of different competence levels is established practice in the systems for qualification and certification offered by different organisations. In [3], we give a more detailed comparison of the systems for International Project Management Association (IPMA), Project Management Institute (PMI) and Prince2.

In [2] we present theories belonging to the world of theory and methods of the world of practice. Theory world includes many theories from social and economical sciences – as Culture Theories, Conflict Theories, Organization Theory, Leadership Theory etc. Practice comprises the typical competence elements known in the project management community.

In IPMA for instance, the framework contains technical competences, behavioral competences and contextual competences. These competence ranges link theories and methods from economy, social sciences and other domains to project management and provide a framework for assessing competences in project management. IPMA makes use of the idea of the "expert's eye" which generates an appropriate reaction within parts of a second. An expert "becomes one with the project".

One challenge of the domain of project management and the corresponding learning process is the wide range of competences needed and the complexity to deal with. Here the picture of doing a repeated "tour of understanding" between the two lakesides supports the idea of stepwise development and emphasizes what project managers report as "being never ready, but always on a tour". Project managers are dealing with "unique" undertakings – and have to be ever learning and seeking people.

The personality of people leading projects seems to be one of the main prerequisite and at the same time the main limitation for the development of these competences. Maybe persons will not reach the expert stage, if they are not able to act with deep social interaction and deep involvement.

The transfer of (tacit) knowledge is dependent on the social relation of teacher and pupil. Is this respected when educating and training young people in project management? We think that just there is some room for improvement of the development of competences. The concept of tacit knowledge clarifies the importance of personal teaching or coaching and also of the teaching climate.

Furthermore, it emphasizes the meaning of practice and also imitation of experts from practice for the development of competences. This is a challenge for project management education especially at unviersities.

The need for the integration of theory and practice is supported in a different way by different learning forms. So the learning forms differ in their contribution to the development of competencies in project management and they differ in their contribution to skill development and to transfer between theory and practice. Some main learning forms and their contribution are presented in our map as shown in Fig. 3:

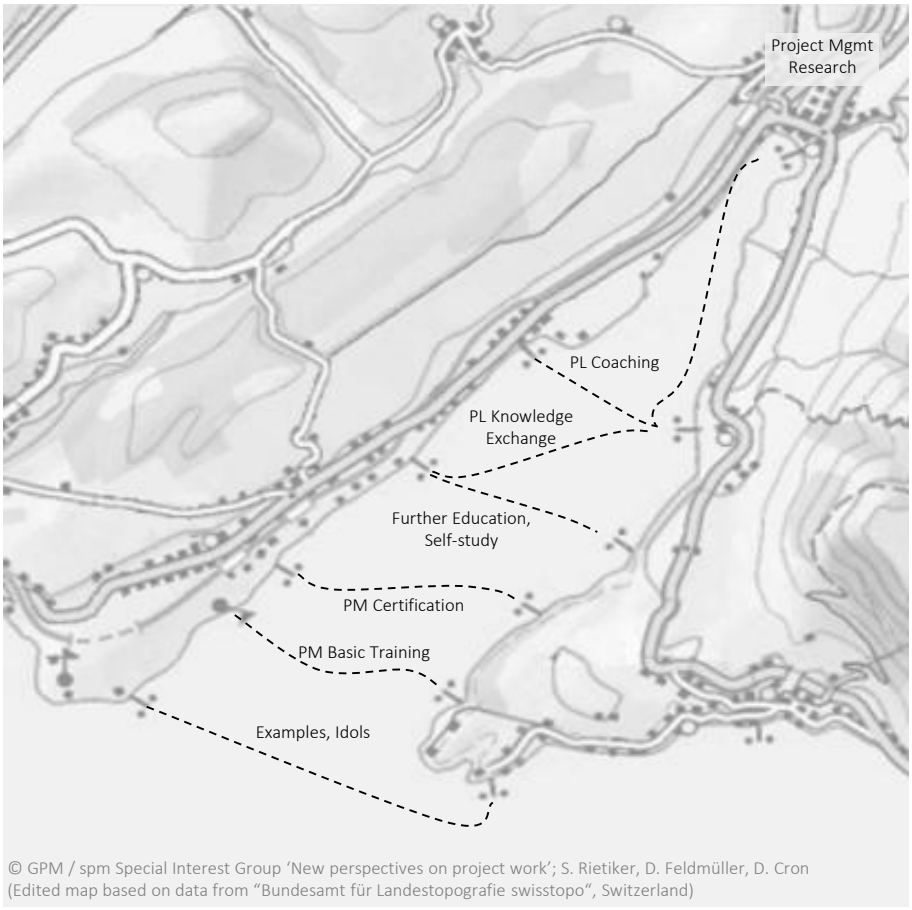

Fig. 3: Knowledge transfer between theory and practice

The bridging between theory and practice and the competence development of these forms may be described as follows:

- Examples, Idols: They may encourage especially implicit respectively practice learning and the understanding of PM, and they provide a base and motivation for knowledge transfer.
- PM Basic Training: These trainings support learning of theoretical background and first practical application in small exercises or case studies and thus represent the main learning form for starting knowledge transfer.
- PM Certification: The preparation for and the certification itself ensure that theoretical background is conform to general PM standards and practice is reflected on that base – so this provides a base for a quicker knowledge transfer with thicker transfer packages.
- Further Education, Self-study: They support further transfer between theory and practice and may be combined individually for personal development.
- Project Leader Knowledge Exchange: The knowledge exchange supports learning from peers in theory and practice and thus enables various possibilities of knowledge transfer in both directions.
- Project Leader Coaching: The knowledge transfer in practice based on theoretical background is an ideal tool for personal development.
- Project Management Research: Here close cooperation and transfer between theory and practice is essential.

When working in projects, technical and methodological facts come along with plurivalent expectations of human beings in combination with a project specific context.

PM Basic Training is needed for starting, but will not satisfy at all. Some small exercises or adequate learning projects are already better than pure course of lectures. However, they can't support competence development much more. Practice is practice and not some exercise or doing some "mickey mouse project". Learning for successful project related work requires a holistic approach integrating more practice than all of the classical forms can do. It needs to be linked closer to practice.

Combinations of self-study of the trainees with courses where the teacher is present (catchword ”Blended Learning”) may support advanced competence development. The self-study can consist of e-Learning lectures, reading books, etc. and reflecting what was learned with the own experience that was made at earlier stage. During the time the teacher is present, time is used mainly for discussion and reflection. By this combination there is a successful integration of theory and practice, and the experience of the trainees is integrated in the training content.

On-the-job-training and coaching are learning forms even more closer to practice. Telling stories, playing, even playing theatre are also forms of interacting with each other, which have opportunities to make people learn when reflected adequately. Such forms of learning may ease the access to the large base of human knowledge and help to what is meant by explicit and implicit integration.

4. Practice of competence development at German universities

Not all of the learning forms are suitable for education at universities or at least not for all kinds of study paths. Thus the formation of special profiles for universities resp. students is enabled.

The university group of the German project management association (GPM Deutsche Gesellschaft für Projektmanagement e.V., see www.gpm-ipma.de) recently collected best practices in education (see [11). We have analysed these best practices. In the following we will give some results of this first analysis.

Some statistical data is:

- 19 German public universities gave a contribution to this collection, among them are 8 universities and 11 universities of applied sciences.
- 2 of the universities have offers which belong to project management study paths, 7 to technical, 5 to economical, 4 to mixed study paths (e.g. Industrial Engineering), and only 1 offer is adressed to all students of all subjects.
- They include 10 bachelor courses, 11 master courses, and 4 offering (different) courses for both degrees.
- The range of the teaching time is from 2 to 5 hours per week, the mean is 3,4 hours per week. The range of ETCS is from 2 to 6 ECTS, with a mean of 4,6 ECTS.
- There are 3 courses without marks, and 19 courses with marks. Marks are evaluated by 6 written tests (6 times), presentations (9 times) and project reports (5 times), including combinations. It is remarkable that the majority asks the students for output as it is demanded in practice in a real project.
- Mostly basic knowledge in project management is teached. As this is an GPM/IPMA group, IPMA standards are mainly used, and 9 universities are also offering basic certification in project management according to GPM/IPMA standards. This is a relatively new offer available only in Germany, a certification asking for project management knowledge, valid for lifetime.

Regarding the integration of pratice into the mostly theoretical learning environment of universities, we now look at the learning forms used in the best practices collected by GPM group:

- All courses provide lectures. There is no e-leLrning course due to the culture of the learning forms at universities, but e-Learning certainly is a rising trend also at universities.
- In almost all courses, lectures respectively theory is complemented by practice:
  - Exercises (21 of 22 courses)
  - Case studies (13 of 22 courses)
  - Games (2 of 22 courses)
  - Working on a real project provided by university (2 of 22 courses)
  - Working on a real project provided by a partner (2 of 22 courses)
- Also, at some unversities there are additional offers of project-based learning integrated in different study paths.

A special example of project-based learning is that of a study path with high integration of theory and practice: the dual education at a university of applied sciences. During their studies of e.g. an engineering subject, students work in a company as trainees. There are two models, one integrating classical

apprenticeship with studies, the other integrating practical projects with studies. The latter one is the more interesting model from the point of view of project management education and is presented in detail in [8]. In this model, students learn on practical projects in their companies and gain decision-making and responsibility competences in engineering and project management. By this, the companies may realise innovative projects, the university has close contacts to the local companies and the students have very motivating learning conditions. This seems to be a win-win-win-model. Concerning project management competencies, the students have to plan und reflect their projects, and the last of the three practical projects also includes teamwork, the coordination of the work of more than one student has to be involved.

From another actual study evaluating the use of the basic certification of GPM, we got an overview of the offers in project management education of the German public universities in one local region of Germany.

Project management today is an important competence for all students, certainly this is true for those students studying economics or engineering. For engineering, this is one of the main key competences according to the German engineering association (Verein Deutscher Ingenieure e.V, VDI, see [17]). Despite this, project management education is not systematically offered to these students. When it is offered, the courses are not always based on international project management standards as provided by IPMA, PMI, PRINCE2. In many cases, assistant lecturers are asked to provide a course in project management and quality highly depends on the knowledge and experience of this person. Also the question of offering additional project management certification to the students is handled differently at the universities – the fact that students pass certification means a quality and maturity proof of the education.

Compared to the year 2000, a lot of progress has been done. At this time the first lectures for project management started, and the first study paths were implemented. As our above statistical data show and is explained with more details by Wehnes (see [18]), many universities offer courses in project management and also some have developed study paths. But there is still development potential for education in project management competencies at German universities.This may especially be true for universities teaching public administration. The prominent failures of large public projects in Germany may indicate a lack of knowledge of project management in this area.

Our statistical data is only small and should be regarded as intermediate result and starting point for further investigations.

5. Conclusion

In order for the trend in “PM Learning and Education” investigated by Gemünden and Schoper (see above, [9]) to become true, we see that:

- Projectification of society and professionalisation of project management needs also more professionalisation in education and learning in project management. For this, there is still development potential at German public universities:
  - Basic courses based on international standards are missing at many universities
  - Advanced courses for professionals are missing too
- Education in project management has to integrate practice – actual best practices respect this already, and they will develop further in this direction
- New media have to be integrated into courses, but project management competence needs learning forms where social interaction is integrated and implicit knowledge is teached
- Professional project management respectively high project management competence needs also a large base of social and economical theories
- Project management research needs close cooperation of theory and practice

Further development of project management education will support people looking for a career in project management and increase the project management competence of the society and especially of the companies and their boardrooms.

As stated already, further systemical investigations for the status of education in project management should be done to get deeper understanding of the status of project management education and training at the universities and also about promising learning forms for project management for bridging theory and practice.

We thank the members of the special interest group “New perspectives in project management” of the GPM for working together in the research program “theory meets practive in projects” and for sharing the results.

We also thank the members of the special interest group “Project Management at universities” of the GPM for sharing the best practices.

6. References

[1] Briscoe, J.P.; Hall, D.T.: Grooming and picking leaders using competency frameworks: do they work? An Alternative approach and new guidelines for practice. Organizational Dynamics, autumn 1999.

[2] Cron, D.; Feldmüller, D.; Rietiker, S.; Böhle, F.; Witschi, U.: Visualizing the Worlds of Theory and Practice, pp. 134 – 160. In: Rietiker, S.; Wagner, R.: Theory Meets Practice in Projects, GPM Deutsche Gesellschaft für Projektmanagement e.V., Nürnberg 2014.

[3] Cron, D.; Feldmüller, D.: Mastering Theories in Practice – A Competence Model, pp. 94 – 115. In: Rietiker, S.; Wagner, R.: Theory Meets Practice in Projects, GPM Deutsche Gesellschaft für Projektmanagement e.V., Nürnberg 2014.

[4] Cron, D.; Feldmüller, D.: Knowledge Transfer between Theory and Practice – Relevant for Developing Project Management Competencies, pp. 116 – 133. In: Rietiker, S.; Wagner, R.: Theory Meets Practice in Projects, GPM Deutsche Gesellschaft für Projektmanagement e.V., Nürnberg 2014.

[5] Dimitrova, D.: Das Konzept der Metakompetenz. GABLER Edition Wissenschaft, Wiesbaden 2008.

[6] Dörner, D.: Die Logik des Misslingens, 15. edition, Rowohlt, Hamburg 2002, first edition in 1989.

[7] Dreyfus, H.L., Dreyfus, S.E.: Mind over machine, Basil Blackwell, Oxford 1986.

[8] Feldmüller, D.; Weidauer, C.: Projektorientiertes Lernen im Ingenieurstudium, pp. 60 – 64. In: projekt Management aktuell, 1/2015, GPM Deutsche Gesellschaft für Projektmanagement e.V., Nürnberg 2015.

[9] Gemünden,H.; Schoper, Y.: Future Trends in Project Management, pp.6 – 16. In: 2014, projekt Management aktuell, 5/2014, GPM Deutsche Gesellschaft für Projektmanagement e.V., Nürnberg 2014.

[10] Gessler, Michael (Ed.): Kompetenzbasiertes Projektmanagement (PM3). GPM, Nürnberg, 2009.

[11] Best Practices, collected by the special interest group „PM an Hochschulen“, http://www.gpm-ipma.de/fileadmin/user_upload/Newsletter/gpm_newsletter/2015_02_februar/2015-01-28_FG_PM_an_HS-Vorlesungsformate.pdf (06-20-2015).

[12] Neuweg, G.H.: Könnerschaft und implizites Wissen, 2. Ausgabe. Waxmann, Münster 2001.

[13] Neuweg, G.H.: Distanz und Einlassung. Skeptische Anmerkungen zum Ideal der „Theorie-Praxis-Integration“ in der Lehrerbildung, Zeitschrift für Erziehungswissenschaft 22 (2011), 43, p. 33-45.

[14] Neuweg, G.H.: Praxis als Theorieanwendung? Eine Kritik am „Professionsgenerierungs- Ansatz“. Journal für Lehrerinnen und Lehrerbildung 3 (2011), p. 17-25.

[15] Polanyi, M.: The Tacit Dimension. Doubleday & Company, New York 1966.

[16] Rietiker, S.; Wagner, R.: Theory Meets Practice in Projects, GPM Deutsche Gesellschaft für Projektmanagement e.V., Nürnberg 2014.

[17] http://www.ingenieurkarriere.de/bewerberservice/beratung/schluesselqualifikationen/detail4.asp?id=26, VDI Verlag GmbH (06-13-2014).

[18] Wehnes, H.: Projektmanagement an deutschen Hochschulen, pp. 75 – 79. In: 2014, projekt Management aktuell, 5/2014, GPM Deutsche Gesellschaft für Projektmanagement e.V., Nürnberg 2014.

A Redesign of Project Management Knowledge Fields

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Key words: *project management, knowledge areas, project management standards*

Abstract

Project management standards use knowledge areas to develop core concepts of project management. The concepts derived so far are incomplete in many aspects and often outdated. A redesign of classical approaches is discussed. To improve communication on classical approaches and new ones we separate the terms “knowledge area” for classical approaches from “knowledge fields” for the new ones. New knowledge fields are added for project organizational management and project sustainability management. Knowledge fields are further developed – new processes are added. The first steps of concept building for a project will be separated a bit from the classical concepts, because often classical concepts are not applicable here.

Introduction

Project management is shaped by standards like PMBOK® [1], or ISO 21500® [2]. Such standards try to cluster knowledge areas to develop core concepts of project management and to develop processes to apply the knowledge of the cluster and to link knowledge areas.

PMBOK® is now available in the fifth edition. The design of the knowledge areas changed over the years – compared to the fourth edition the former knowledge area on Project Communication Management has been split to develop a new knowledge area on Project Stakeholder Management.

ISO 21500® was introduced in time when the fourth edition of PMBOK® was still used and the fifth edition was prepared. So ISO 21500® got a “knowledge” area on stakeholder management before the new PMBOK® was published. The other “knowledge” areas of ISO 21500® are more or less identical with those of PMBOK® – but ISO 21500® changed the terminology – “knowledge” areas are subject areas now. Anyway ISO 21500® is very similar to PMBOK® with a focus on project management processes.

Both concepts are based on process groups to support the project life cycle, the concepts of the process groups are quite similar, they have differences in terminology.

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PMBOK	ISO 21500
Initiating Process Group	Initiating
Planning Process Group	Planning
Executing Process Group	Implementing
Monitoring and Controlling Process Group	Controlling
Closing Process Group	Closing

Table 1: Names of Process Groups in PMBOK® and in ISO 21500®

PMBOK® and ISO 21500® are also very similar in their scope. Both standards do not have a knowledge area on project finance – an important issue in project management from the very beginning. Both standards do not have a knowledge area on sustainability – may be that will come later. We do not expect a knowledge area on project finance, because at PMI project finance is located in the Program Management Guide [3].

PMBOK® and ISO 21500® are also very similar regarding missing processes esp. in the initiating phase and in the closing phase. In the initiating process group a review of lessons learned and a review of strategies are missing and in the closing process group the collection and communication of lessons learned is undeveloped.

Since the very first years of PMBOK® Project Organizational Management was only covered by some introductory remarks. Remarks on functional organization, matrix organization, and projectized organization are copied from edition to edition, but are outdated now in several aspects. The IPMA OCB® is much better here, including project management offices and supporting strategical and operational aspects [5], [6].

In ISO 21500® they tried to fill the gap regarding project organizational management by introducing a process “Define Project Organization” – but the contribution here is less than a page – and more a hint for further development.

1. Knowledge Areas in PMBOK®

The "Guide to the Project Management Body of Knowledge (PMBOK Guide) was first published by the Project Management Institute (PMI) in 1996. That document was to some extent based on earlier work that began with a white paper published in 1983 … The second edition was published in 2000. In 2004, the PMBOK Guide — third edition was published with major changes from the previous editions. The fourth edition was published in 2009. The latest English-language PMBOK Guide — fifth edition was released in 2013" [19]. The 6th edition is announced for 2017 [4].

The figure below shows the table of knowledge areas and process groups of the fifth edition of PMBOK®. After all the years PMI worked on PMBOK® it is still surprising, that in this table there are so many "white" areas. In all knowledge areas in the initiating phase processes on the review of lessons learned and on the review of strategies and standards to apply are missing, and in most knowledge areas in the closing phase processes on collecting lessons learned are missing. A process to release the project team is missing here – and many more.

In most knowledge areas in execution phase processes to collect and prepare data for monitoring and controlling are missing.

In the knowledge area on project risk management only two phases are covered – the planning phase and the monitoring and controlling phase. It is not possible to start project risk management without a review of risk strategies of on organization. Risk management processes dealing with risk mitigation, risk avoidance, etc. can only be developed when risk strategies are known.

In the corresponding "knowledge" area in ISO 21500® in the "executing" phase a process to "Treate Risks" is defined (table 3) – in PMBOK® here is nothing.

There is no knowledge area on project finance, no knowledge area on project organizational management and no knowledge area on sustainability. In that context not even single processes in existing knowledge areas are available with support functions.

Project Management Knowledge Areas and Process Groups

According to PMBOK

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
Project Integration Management	Develop Project Charter	Develop Project Management Plan	Direct and Manage Project Work	Control Project Work, Control Changes	Close Project of Phase
Project Scope Management		Plan Scope Management, Collect Requirements, Define Scope, Create WBS		Validate Scope, Control Scope	
Project Time Management		Plan Schedule Management, Define Activities, Sequence Activities, Estimate Resources, Estimate Activity Durations, Develop Schedule		Control Schedule	
Project Cost Management		Plan Cost Management, Estimate Costs, Determine Budget		Control Costs	
Project Quality Management	Analyse and determine Strategies and Standards to use	Plan Quality Management	Perform Quality Assurance	Control Quality	
Project Human Resource Management		Plan Human Resource Management	Acquire Project Team, Develop Project Team, Manage Project Team		Collect and submit lessons learned
Project Communications Management		Plan Communications Management	Manage Communications	Control Communications	
Project Risk Management		Plan Risk Management, Identify Risks, Perform Qualitative Risk Analysis, Perform Quantitative Risk Analysis, Plan Risk Responses		Control Risks	
Project Procurement Management		Plan Procurement Management	Conduct Procurements	Control Procurements	Close Procurements
Project Stakeholder Management	Identify Stakeholders	Plan Stakeholder Management	Manage Stakeholers Engagement	Control Stakeholder Engagement	

Table 2: Project Management Knowledge Areas and Process Groups according to PMBOK® [1]

2. Subject Groups in ISO 21500®

The following table on subject groups and process groups is quite similar to the PMBOK® table above. The subject group for stakeholder management is located directly after the subject group for project integration management – in PMBOK® the new knowledge area on project stakeholder management was put at the end of the table.

Project Management
Subject Groups and Processes
According to ISO 21500

Subject Groups	Process Groups				
	Initiating	Planning	Implementing	Controlling	Closing
Integration	Develop Project Charter	Develop Project Plans	Direct Project Work	Control Project Work, Control Changes	Close Project, Collect Lessons Learned
Stakeholder	Identify Stakeholders		Manage Stakeholers		
Scope		Define Scope, Create WBS, Define Activities		Control Scope	
Resource	Establish Project Team	Estimate Resources, Define Project Organization	Develop Project Team	Control Resources, Manage Team	
Time		Sequence Activities, Estimate Durations, Develop Schedule		Control Schedule	
Cost		Estimate Costs, Develop Budget		Control Costs	
Risk		Identify Risks, Assess Risks	Treat Risks	Control Risks	
Quality	Analyse and determine Strategies and Standards to use	Plan Quality	Perform Quality Assurance	Perform Control Quality	
Procurement		Plan Procurement	Select Suppliers	Administer Contracts	
Communication		Plan Communications	Distribute Information	Manage Comunication	

Table 3: Subject Groups and Process Groups according to ISO 21500 [2]

There is one more "knowledge" area with a process in the initialing phase. In resource management there is the process "Establish Project Team". The role of this process in the initiating phase is more than dubious. "The purpose of 'Establish Project Team' is to obtain the human

resources needed to complete the project. The project manager should determine how and when project team members are to be acquired as well as how and when they will be released from the project." [ISO 21500, page 26]

In the subject group for resources in the planning phase there is a process on "Define Project Organization". "The definition of the project organizational structure includes the identification of all project team members and other persons directly involved in the project work … (and) includes the assignment of project responsibilities and authorities." [ISO 21500, page 27]

Such a process is not in PMBOK®. ISO 21500® goes here in the right direction. A single process on resources on the other side remains a bit isolated.

Project management offices are not mentioned here. Enterprise PMOs can support the implementation of a PMO. And PMOs are part of the project organization.

3. **A Redesign of Project Management Knowledge Fields**

The analysis of gaps and inconsistencies leads to extensions of knowledge areas in classical standards as discussed since years, for example in [7], …. , [17]. The following table completes the classical table in PMBOK®, project organizational management and project sustainability management are added knowledge areas. Details in project organizational management are discussed in [7],[9] details on project sustainability management in [10],[12] for example.

All boxes (crossing of knowledge areas and process groups) have processes. In the initiating phase a review and analysis of strategies and standards is important in all fields. No planning process can start without clear perspectives how to meet requirements of strategies and standards. No human resource planning is possible without information on what kind of resources the organization would prefer (own staff, consultants, etc.), what kind of human resource development is acceptable, which rules for the compensation of project team members should be applied, etc.

In the execution phase the process "Treate Risks" is taken from ISO 21500®. In the closing phase in all knowledge areas it is important to collect and communicate lessons learned and start special activities to close the processes of a given knowledge area.

Project Management
Extended Knowledge Areas

	Initiating	Planning	Executing	Monitoring Control	Closing
Project Organization Management	Review Organizational Strategies	Plan Project Organization	Establish Project Organization	Monitor and Control Project Oragnization	Close Project Organization
Project Integration Management	Project Charter	Project Management Plan	Manage Work	Monitor, Control	Close Project
Project Scope Management	Analyse and determine Strategies and Standards to use	Scope, Requirements, WBS	Collect Information	Control Scope	Collect and submit lessons learned, close
Project Time Management	Analyse and determine Strategies and Standards to use	Plan Schedules, Resources, ...	Collect Information	Control Schedule	Collect and submit lessons learned, close
Project Cost Management	Analyse and determine Strategies and Standards to use	Plan Costs	Collect Information	Control Cost	Collect and submit lessons learned, close
Project Quality Management	Analyse and determine Strategies and Standards to use	Plan Quality Management	Perform Quality Assurance	Control Quality	Collect and submit lessons learned, close
Project Sustainability Management	Analyse and determine Strategies and Standards to use	Plan Sustainable Management	Perform Sustainable Project Execution	Control Sustainable Project Execution	Collect and submit lessons learned, close
Project Human Resources Management	Analyse and determine Strategies and Standards to use	Plan HR Management	Perform HR Management		Collect and submit lessons learned, close
Project Communication Management	Analyse and determine Strategies and Standards to use	Plan Communications Management	Manage Communications	Control Comunication	Collect and submit lessons learned, close
Project Risk Management	Analyse and determine Strategies and Standards to use	Identify Risks, Plan Risk Management, Analyse Risks	Treat Risks	Control Risks	Collect and submit lessons learned, close
Project Procurement Management	Analyse and determine Strategies and Standards to use	Plan Procurements	Peform Procurements	Control Procurement	Close Procurements
Project Stakeholder Management	Identify Stakeholders	Plan Stakeholder Management	Manage Stakeholers	Control Stakeholders	Collect and submit lessons learned, close

Table 4: Extended Knowledge Areas for Project Management, “black boxes” are empty in PMBOK® (made by author, based upon PMBOK®)

Necessary extensions of processes in project management cannot be finished successfully for individual knowledge areas or separate issues like project organization. There is a strong interaction of knowledge areas and process groups. The structure of the knowledge areas in PMBOK® seems to be not suitable for major improvements.

The problems with knowledge areas in PMBOK® even start with the first knowledge area on Project Integration Management. The process “Develop Project Charter” is located here but remains lost among the issues on project integration. A knowledge field on Concept Building is much better – isolated from project integration and not overloaded by issues that do not contribute to concept building.

Concept building starts with a review of strategies to develop a concept how a new project can support given strategies or can be used to develop strategies. The result of the concept building processes is a discussed and confirmed project charter. These processes should be separated somehow from the classical overall integration concepts – finally it´s too early for these concepts – and nobody will really apply the complex integration processes here.

Stakeholder management and project organization management follow. From scope management we follow core concepts of PMBOK® - sustainability management is added and shaped as the "sister" of quality management.

Knowledge Fields in Project Management	
1. Concept Building Review Strategies (Innovation, …) Shape Ideas, Initialization Develop Project Charter Communicate Project Charter Decide about Project Charter	**7. Quality Management** Review Quality Strategies Plan Quality Manage Quality Control Quality Close Sustainability
2. Stakeholder Management Identify and List Stakeholders Manage Stakeholders	**8. Sustainability Management** Review Sustainability Strategies Plan Sustainability Manage Sustainbility Control Sustainability Close Sustainability
3. Project Organization Management Review Organizational Strategies Develop Organizational Structures Create/Develop PMOs Develop Organizational Processes Run Organizational Processes Control Project Organization Close Project Organization	**9. Human Resources Management**
4. Scope Management	**10. Communications Management**
5. Time Management	**11. Procurement Management**
6. Cost Management	**12. Risk Management**
	13. Integration Management

Table 5: Knowledge Fields for Project Management (made by author)

Table 4 with the new knowledge areas on project organizational management and project sustainability management and with the additional processes in many other knowledge areas is the first steps for a redesign of project management knowledge areas.

Table 5 goes beyond the classical PMBOK table and beyond limited extensions and shapes knowledge fields - starting with contributions on concept building.

4. Results and Conclusion

The results presented here – together with complementary papers like [7] and [9] – are part of a broad initiate in the context of the European Master in Project Management. Software system will support the development of new process descriptions and practical applications [18]. There is a real demand in the project management community to extend and reshape classical standards.

5. References

[1] PMI: Guide to the Project Management Body of Knowledge, PMBOK, 5th edition, Atlanta 2013.

[2] ISO 21500, 2012 - http://www.iso.org/iso/home/news_index/news_archive/news.htm?refid=Ref1662

[3] PMI, The Standard for Program Management, 3rd edition, Atlanta 2013

[4] http://www.pmi.org/PMBOK-Guide-and-Standards/Standards-Current-PMI-Standards-Projects.aspx

[5] IPMA OCB - http://ipma.ch/resources/ipma-publications/ipma-ocb/

[6] IPMA OCB 1.0, International Project Management Association , 2013

[7] Reusch, Peter J. A.; Pogrebniak, Viktoriia: How to shape Project Organization Management? International Research Conference at the University of Applied Sciences and Arts in Dortmund, Dortmund 2015.

[8] Reusch, Peter J. A.: Extending Project Management Processes, Intelligent Data Acquisition and Advanced Computing Systems – IEEE-IDAACS 2015 - Warsaw. http://www.idaacs.net/

[9] Reusch, Peter J. A.: On the Role of Project Organization in Project Management Standards and New Approaches for Project Organization, International Scientific Conference on Project Management - Kiev 2015.

[10] Reusch, Peter J. A.: Extending Project Management Processes and Introducing New Processes for Sustainability, Fourth International Scientific Conference on Project Management in the Baltic Countries - Riga 2015.

[11] Reusch, Peter J. A.; Ojeda, Omarly: Sustainable Procurement - Extending Project Procurement Concepts and Processes Based on PMBOK, Intelligent Data Acquisition and Advanced Computing Systems – IEEE-IDAACS 2013 - Berlin. http://www.idaacs.net/

[12] Reusch, Peter J. A.: Responsibility and Sustainability in Projects, International Research Conference at the University of Applied Sciences and Arts in Dortmund, Dortmund 2013.

[13] Reusch, Peter J. A.: Project Management Supported by Object Role Modeling, International Conference on New Challenges of Economic and Business Development – 2012, University of Latvia, Riga 2012. http://www.evf.lu.lv/conf2012/

[14] Reusch, Peter J. A.; Otegi, Jose Ramon; Kushnood, Muhammad: An Object Role Oriented Project Management Approach, First International Scientific Conference on Project Management in the Baltic Countries - Riga 2012. http://www.evf.lu.lv/pmconf2012/

[15] Reusch, Peter J. A.; Löhr, Katrin: What Can Standards Standardize in International Project Management, First International Scientific Conference on Project Management in the Baltic Countries - Riga 2012. http://www.evf.lu.lv/pmconf2012/

[16] Reusch, Peter J. A.: New Standards for Project Audit and the Impact on Existing Standards for Project Management, Intelligent Data Acquisition and Advanced Computing Systems – IEEE-IDAACS 2011 - Prague. http://www.idaacs.net/

[17] Reusch, Peter J. A.; Khan, Rao Aamir: Towards Developing Social Responsibility Standard for Project Management, International conference on management, business ethics and economics, Lahore, Pakistan, 2011.

[18] Deependra Prasad Acharya, Kamal Marasini: Representation of Project Management Processes based on SVG embedded in a Web-Application to Support Project Management and Training, Master Theses, Dortmund 2015.

[19] https://en.wikipedia.org/wiki/Project_Management_Body_of_Knowledge

DEVELOPMENT OF ORGANISATION COMPETENCES IN PROJECT MANAGEMENT

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Keywords: individual and organisation competences, project management, IPMA International Competence Baselines, IPMA Organisation Compenetce Baseline, intellectual competences, emotional competences, carrier development.

Abstract

The essence of development of organisation competences in project management is based on a clear separation of business objectives and objectives of the project activities. We propose to assess the competence on the base of the analysis which to covers entire professional career of a specialist monitoring the most important dynamic characteristics of the formation of his or her professional competence. This approach could help to eliminates many of the contentious issues of project management, to build a more complete, clear picture of the system requirements for the competence of experts in the field of Project Management. In practice, organizational development leads to the fact that in the professional Project Management together with the importance of level of intellectual competences, is no less important is level of emotional competences. Organisational development offers a way for harmonization of project management activities.

1. Introduction

In an environment shaped by the global financial and economic crisis, issues related to improving management productivity and increasing the level of competitiveness assume special urgency. As concerns management of organization, and project management in particular, the topic of shaping individual and collective competencies becomes eminently relevant in the context of improving management productivity. A lot of discussion has ensued following the implementation of IPMA International Competence Baseline (ICB) [1] for project management (PM) specialists, now under development, in connection with their practical application and significance in enhancing management competitiveness.

Having separated project activities from general business activities, practitioners/methodologists have discovered considerable benefits produced by the use of the disciplinary specialization method: there has begun to emerge a "project" approach, and the methods utilized by that approach have become both broader and deeper. Practical application of those methods has resulted in a massive improvement of labor productivity, primarily in the management domain. These successes have started to prompt methodologists to transfer the "project" approach to managing any type of activity, including general business management. This trend could also be observed in the development of ICB. Moreover, proponents of methodological expansion of the project approach criticize ICB developers for their failure to assure universal application of that approach to strategic management of organization, investment and production activities.

On the whole, the situation is advancing along the lines of evolution of general scientific methods: science *ab initio* dealt with integrated objects giving rise to general disciplines, and only later there came differentiation of research objects and specialization of scientific disciplines. Recently we have witnessed increasing popularity of interdisciplinary integrated approaches due to realization of negative consequences engendered by excessive bias towards narrow specialization (abstract analysis) at the expense of synthesis. PM methodologists, disregarding the relation between project activity and other types of activity, and oftentimes artificially carving a project activity component out of an integral system, find themselves in an exploratory dead-end detached from real practical activity. Therefore, when designing project activity methodology, one should understand its place among other human pursuits and, in particular, its place in business activity. It is important to remember why PM was segregated from general management as an independent specialized discipline in the first place,

what meaning we ascribe to the term "project activity", and what makes it stand out among other types of activity [2].

The main dilemma of the existing approach to ICB is this:

- on the one hand, in an attempt to assure system-wide PM coverage, ICB fails to introduce, at the highest level of management, a clear-cut division between general administrative management, production activity management, and PM;
- on the other hand, ICB (including ICB-3) undeservedly omits from PM a number of critical components related to human natural, genetically determined propensity for management, his competence in goals definition and setting, his holistic management and integrity management abilities, etc.

This dilemma is rooted in our definition and understanding of project activity. If we believe that project activity involves everything related to creation of a product/service, from begetting the initiative to reaping the profits/dividends from exploitation of that product/service, then the scope of PM must encompass all those aspects. And the existing ICB version strives to do just that. However, within the framework of this approach we end up merging project and production activities, which results in a fundamental departure from the conceptual division of business activity into production activity and project activity. In this variant, the ultimate goals of project and production activities are the same, and production activity is subsumed by project activity. In fact, in this case project activity equals business activity. But then there arises the question: why introduce the notions of "project" and "project activity"? Why was project activity separated from production activity?

If we define the "project" as creation of a new (unique) product/service whose exploitation (production activity) yields profit, then there is unambiguous understanding that the project ends when such product/service is obtained, whereupon there begins production activity whose main purpose is to gain profit. Such teleological approach is justified if project and production activities are deemed separate from business activity. ICB assumes such differentiation and, therefore, the ultimate purpose of project activity is not to gain profit, but to obtain a new (unique) product/service. In other words, project activity seeks attainment of objectives which are narrower than those of business activity. The strategic objective of business activity is to gain profit, and that objective subsumes the objectives of both project and production activities.

2. Systemic Boundaries between General Business, Operating and Project Management Activities of the Organization

ICB's methodological ambiguity leads to confusion of PM role competencies. Because of that ambiguity, consumers of the OCB [3,4] methodology sometimes cannot answer basic project management questions: for example, when does a project end?

Apparently, disambiguation requires a systemic demarcation of objects, subjects and processes of general business management, operating activity management, and project activity management. This is an issue of arriving at an agreement with respect to delimitations, conventional covenants between the members of a community. For example, the boundaries could be drawn as follows:

- general business management comprising business strategy management (including investment management) and administrative management (including finance management);
- project activity management (including improvement and development processes);
- operational activity management (production activity, operating service/support/maintenance).

In the course of startups, modernizations, modifications, business is realized primarily by means of project activity purporting to create new (unique) products or services (or standard products and services created in unique conditions).

The purpose of subsequent production/operating activity is exploitation of project activity products. Profit could serve as an intermediate purpose and, completing the organization's business life cycle,

we arrive at its end result – fulfillment of its mission – satisfaction of social needs of consumers (both external and internal).

Occasionally PM methodologists disregard the relation between project activity and other types of activity and, artificially carving a project activity component out of an integral system, find themselves in an exploratory dead-end, while the fruits of their labor prove to be detached from the realities of practical activity.

In this connection, we would like to remind project activity methodologists that they need to understand the place of project activity in general business activity.

It is important to remember why PM was segregated from general management as an independent specialized discipline in the first place, what meaning we ascribe to the term "project activity", and what makes it stand out among other types of activity.

In project activities the main objects are the portfolios of projects, program, projects, new (unique) products and services; in the operating activities - production of typical products, services, standard operations. Naturally, different objects of control put objectively different requirements to the competency of the subjects of management. In spite of the fact that objects of the project activities connected with the objects of production, between the requirements for competences of project managers and managers of production there are fundamental differences. These requirements impose restrictions not only for the purchase of quality, but also for congenital abilities, congenital qualities of each human being. If the person is by nature not in a position to deal with changing conditions, with large levels of uncertainty, work creatively and in a non-stop mode, if he or she does not able to take to yourself part of mutual responsibility (carry integrated responsibility), it does not make sense to try to turn such a person be a head of the complex or innovation programs and projects to apply to him or her the requirements of level A or B of the IPMA 4LC [1].

Both International and National Competence Baselines for PM specialists were originally predicated on evaluation of competence in operating/production activity. But production activity is not the same as project activity. Despite the fact that in real life project activity and operating/production activity intersect and overlap, it is possible and necessary to draw a line of distinction between them.

In practice, at the point of transition from purely functional (production) management structures to project management structures, the pool of managers is largely formed from production managers. When that happens, production management principles are dominate in those managers' mentality, haunt them even at the subconscious level. Mental transformation (conversion) from production management to project management is the key for building of PM specialists’ competence.

The most sustainable results in change management are those that lead to improvement of the management mental universe.

Both the original management mental universe and the fruit of its transformation depend on culture and traditions of civilizations and countries. Whatever we may say, the existing ICB version is biased in favor of the occidental civilization. But if one of the objectives of ICB is to design supranational competence benchmarks for PM specialists, it is also necessary to take into consideration certain fundamental features inherent in oriental mentality.

On the one hand, our paradigm essentially relies on a distinct separation of business objectives from project activity objectives. On the other hand, we postulate that evaluation of the project manager's competence should not be restricted to the "active" phase of his or her professional career, that it should instead incorporate an analysis of his or her entire life cycle, all the way back to the time when he or she emerged as a personality and received primary, secondary and higher education, taking stock of critically important dynamic properties which determined the shaping of his or her professional competencies. This platform makes it possible to eliminate many disputed project management aspects, and sketch a holistic, lucid, systemic picture of competence benchmarks for PM specialists [5].

3. On Systemic Coverage of Project Activity Roles

PM specialist competence benchmarks stipulated by ICB are rather similar to competency summaries provided, for example, by PMBOK, and basically boil down to descriptions of management objects, such as projects and project programs, and, to a lesser extent, program and project portfolios, making virtually no mention of management subjects and objects, creation of project management systems, PM knowledge management systems, corporate strategies and PM business processes.

But the key issue of systemic project activity ontogenesis at any organization is the development of strategic and methodological approaches to project management, project management business processes and systems. In other words, each organization must have full-time professionals with relevant competencies. Even if third-party resources are enrolled at any stage of development of an organization's project management system, success of its efficient implementation, support and evolution hinges on availability of in-house experts. These are, first and foremost, the following specialists:

- Project management system architect;
- Project management methodology support and development manager;
- Director of Organization Project Office (who can concurrently act as PM business process owner and PM Corporate System Director) – Chief Project Officer of organization;
- PM systemic analysis and expert evaluation manager;
- Collective competencies manager;
- PM knowledge management system leader;
- Others.

The existing ICB approach to project management competence benchmarking fails to provide a detailed description of these roles.

In our approach, we propose to consider not only acquired properties of specialists, but also their inbred properties. Heredity definitely has some impact on professional abilities of project managers. Genetics has indisputably demonstrated that human behavior is largely determined by heredity, by DNA-transferred characteristics. Genetically-driven propensity of man for management has been demonstrated by recent research [6].

An important element of professionalism in management, and in PM in particular, is self-possession, ability to control one's emotions. Man is a non-linear system: relation between stimulus and response amplitude is non-linear. If a manager understands that, he or she will cause the competence-building process to be biased in favor of enhancing the mechanism responsible for governing responses to stimuli and the amplitude/strength of such responses.

In practical terms, application of this component of the paradigm results in the level of EQ (Emotional Quotient) in professional management being as important as the level of IQ (Intelligence Quotient). Therefore, it is critically important that emotion management competence be incorporated into any competence formation, development and evaluation system [7].

The paradigm proposes a more coherent union of evolutionary and systemic principles in competence evaluation and ontogenesis. The synergistic principles implemented in the paradigm facilitate formation of the self-organization competence block.

4. Results and Conclusion

The proposed individual and collective competence approach for project management specialists is based on separation of business objectives from the objectives of project and operating/production activities of organization.

The paradigm makes the coverage of management objects, subjects and project processes wider and more systematic.

It is necessary to complement the specialist competence evaluation system with evaluation of both inbred and acquired properties, and of intuitive, empathic, holistic abilities as they apply to project management. It is possible to increase project management specialist competence by creating an efficient environment conducive to accumulation and development of collective professional

competencies within the organization. It is suggested that the process of PM education, training and competence formation be supplemented with a role-based approach to enhance the current functional approach.

The approach proposes a more coherent union of evolutionary and systemic principles in competence ontogenesis and evaluation.

This approach will help to resolve many disputed project management issues and build a more comprehensive and self-consistent system of competence benchmarks for PM specialists.

References

[1] International Competence Baseline IPMA ICB - IPMA Competence Baseline. Version 3.0. IPMA Editorial Committee. IPMA, 200 p. (2006)

[2] A Guide to the Project Management Body of Knowledge. 5 Edition.National Standard of USA ANSI/PMI 99-001-2008, Project Management Institute, (2012)

[3] Bushuyev Sergey D., Wagner Reinhard F. IPMA Delta and IPMA Organisational

Competence Baseline (OCB): New approaches in the field of project management

maturity, International Journal of Managing Projects in Business, Vol. 7, (2014)

[4] IPMA Organisational Competence Baseline (IPMA OCB). IPMA, 67 p. (2013)

[5] Chamorro-Premuzic, T., & Furhnam, A. Intellectual competence and the intelligent personality: A third way in differential psychology. Review of General Psychology, 10, p.251-267. (2006)

[6] Legare Robert D., Genetics: Predisposition and Management. Lippincott Williams & Wilkins, Inc., (2011).

[7] Tanaka H. Scenarios of project management in the mixed culture of PM: the experience of Japan**.** Project and program management №4, (2005).

COMPARATIVE ANALYSIS OF APPROACHES TO THE IT PROJECT MANAGEMENT

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Keywords: IT Project Management, waterfall life cycle, agile methodology, scrum.

Abstract

The aim of this work is a comparative analysis of two trends in IT-project management in software development. The subject of the research is an approach to IT project management (models and methodology). For the attention taken waterfall (cascade) model of the life cycle of an IT-project on one side and agile methodologies on another side.

Introduction

With the development of information technology has become evident that, using various automated information systems, it is possible to increase the efficiency of business processes. So with the increasing involvement of IT products to society the theme of effective IT project management has become very important. It is worth noting that the quality of the product IT project in an organization can greatly affect its activity. In this paper will be considered approaches to managing software development projects.

In many organizations, the life cycle of IT projects is considered from the point of view of the traditional waterfall model, the application of which, in my opinion, is based more on manager's habit. In recent years become increasingly popular agile methodologies of IT project management. They are promoted as a methodology, "open to change", what is very important in the case of IT projects, which are managed in a rapidly changing environment.

Comparative analysis

Nowadays, one part of the organizations took the direction of the automation of processes, and the other part began to create software for delivering organizations first

type. In both cases the organizations deal with IT-projects, which are difficult to manage because of dynamic environment. So the question is relevant approaches to the management of IT projects.

Since 1970, the traditional approach to IT-project management in software development is the waterfall model, which is an ordered sequence of different phases of the project. Each phase cannot begin before the end of the previous one. So it is necessary a definite formulation of the problem for the project from the beginning. [1] However, any IT-project cannot be planed in a way that pre describe all features functional requirements for the software.

With the development of IT projects it became clear that the approach to managing dynamic projects should be sufficiently flexible. Therefore, to replace the traditional waterfall model was proposed a new methodology, called "agile methodology". The basis for its creation were combined strengths of iterative and spiral model of life cycle. Those borrowed principles include turn-based development and availability of finished parts of software (iterative model) and focus on the human factor and on the analysis of possible risks (spiral model) [2].

As a result in 2001 was described by the new approach in the management of IT projects. The special features of agile methodology include the following:

1) the ability to quickly respond to changes in a dynamic business environment changes caused by the influence of customer and threats of market;

2) willingness to adapt to different scales of projects;

3) the ability to quickly change the priority of resources in response to changes of requirements, technology and knowledge;

4) use incremental approach to supply product for maximum satisfaction of the customer;

5) the maximum increase in profitability of the project by the desire to complete all work in defined period.

After several years of use conducted many studies aimed at studying the advantages of agile methodologies over waterfall model of life cycle of IT-project. Thus, research of Internet resource Version One says that 84% of respondents (developers) recognized that the agile methodology is more effective than waterfall model. In addition, 70% of respondents of the same research shown that IT-projects with applying agile

methodology are realized much more quickly than when applying traditional waterfall model.

Therefore, the main task of this work is to compare of waterfall (cascade) model of the life cycle of an IT-project and agile methodologies. The subject of comparing are features of IT-projects. **Results of research** are displayed in Table 1.

Table 1.

Compare waterfall model and agile methodologies

	Waterfall model	**Agile methodologies**
Customer requirements	Determined prior to development	May vary for each iteration
The cost of modifications	High	Low
The direction of development	Fixed	May vary for each iteration
Testing	Only during certain phase	After each iteration
The involvement of the customer	Low	High

Conclusion

The result of the comparison can show that the flexible methodology is superior to traditional waterfall model by key features of IT projects.

Today there are many varieties of agile methodologies (XP, scrum, lean, kanban, etc.). To apply the methodology it is necessary to analyze characteristics and nature of projects that take place in the organization. The most popular (55%, the next figure is only 11%) is the methodology «scrum» and each year this figure is growing [3].

An important problem is a practical comparison of waterfall model and methodology «scrum». Special attention require indicators of time and finance . It is necessary to analyze which of the approaches is more efficient and less deviation of the key indicators.

References

[1] Wikipedia - the free encyclopedia [electronic resource]. - Https://uk.wikipedia.org/wiki/Водоспадна_модель, last visited on May 03 (2015)

[2] Wolfson B. "Agile methodology development", version 1.2 (e-book) (2012).

[3] Shvaber Ken, Jeff Sutherland "Guidance on the edge: rules of the game" (e-book) (2013).

INKA-Suite 2 – An SDK for eye-tracking enabled real-time web applications

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Key words: eye-tracking, gaze sharing, real-time collaboration, *sdk*.

Introduction

The use of eye-trackers for analyzing eye movements is a well-established scientific method in Human-Computer Interaction (HCI). But also the interactive use of gaze data for controlling user interfaces has long been part of the research. However, the area of application of the related software is limited to individual users. In the research fields of Computer-Supported Collaborative Work (CSCW) and Computer-Supported Collaborative Learning (CSCL) which are associated to HCI, the aspects of joint interaction play an important role. Those aspects though go beyond the mentioned area of application. In this work we present a solution in form of a Software-Development-Kit (SDK), which can be integrated into existing or newly created web platforms without the need for browser add-ons. The integration enables the application to simultaneously use gaze data from multiple individuals for analytical and interactive purposes.

1. INKA-Suite 2

The INKA-Suite 2 is a distributed application. The gaze data is provided by external eye-tracking hardware, which broadcast the gaze data on the network. This data is captured by the first component, the so-called Gaze-Data-Hub. For each eye-tracker one Gaze-Data-Hub instance is required. It offers a wide arrange of filters to derive further gaze information from the raw gaze data stream like fixations and saccades. It also takes care of the user specific eye-tracker calibration. The receiver is the INKA-Suite Core, a NodeJS Server running a Socket.IO component. Directly attached is the NoSQL database MongoDB, which is used to store all in- and outgoing data which can then be used for analysis. Similar to a publisher-subscriber model the gaze data is then forwarded from the Socket.IO Server to the destination software, which only has to include a JavaScript library to receive and send gaze (or any) data from and to the INKA-Suite Core. In addition, a JQuery plugin named Gaze-Sensitive can be used to easily transform any GUI element to a gaze enabled element. A variety of callbacks can then be overwritten to interact with those elements by just using gaze data. It supports all well-known gaze input methods like dwell-based (Hansen et al. 2003), gaze-augmented (Jacob 1991) or smooth pursuits (Cymek et al. 2014). The gaze data access is not limited to one individual at a time, so multiple gaze data streams can easily be merged at runtime to detect shared gaze or joint attention, which are crucial to collaboration quality.

2. Initial study

The INKA-Suite 2 was first used in a collaborative scenario, where dyads had to solve a puzzle with different support of real-time gaze sharing. The research question was to evaluate a new visualization for context-based (What?) gaze sharing. Coordinate-based (Where?) gaze sharing is known to have a positive effect on collaboration quality (Schneider and Pea 2013; Richardson and Dale 2005), but is limited to What-You-See-Is-What-I-See (WYSIWS) (Stefik et al. 1987) interfaces. If similar results could be achieved using a context-based gaze sharing, this detailed level of awareness could be used outside of the WYSIWS domain as well, which would expand the area of application for gaze sharing. The INKA-Suite 2 was on the one hand used for the interactive functionality, the coordinate- and context-based gaze sharing, and on the other hand for capturing all necessary data for the analysis.

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3. Results and future work

During the development extensive tests and benchmarks were performed to ensure usage efficiency and latency, which came in handy while preparing the material for the initial study. The INKA-Suite 2 SDK reduced development time drastically and allowed us to skip the usual eye-tracking related work. The interactive gaze sharing could easily be implemented using the JQuery plugin. Using the NoSQL approach all needed data could be stored without worrying about table schemes or message structure. With little effort all necessary data for analyzing the study data could be exported and used in third-party applications. In summary, the INKA-Suite 2 has been found to be very helpful for analytical and interactive gaze data use in multiuser real-time applications.
The SDK will be used in the research project "Eyetracking based interaction management of synchronous written communication"† (Ebiss) which is funded by the Deutsche Forschungsgemeinschaft (German Research Foundation). During that project duration further developments and extensions will be added to the INKA-Suite 2.

4. References

[1] Cymek, Dietlind Helene; Venjakob, Antje Christine; Ruff, Stefan; Lutz, Otto Hans-Martin; Hofmann, Simon; Roetting, Matthias, 2014: Entering PIN Codes by Smooth Pursuit Eye Movements. In: Journal of Eye Movement Research 7 (4).

[2] Hansen, John Paulin; Johansen, Anders Sewerin; Hansen, Dan Witzner; Itoh, Kenji; Mashino, Satoru, 2003: Command Without a Click: Dwell Time Typing by Mouse and Gaze Selections. In: Proceedings of Human-Computer Interaction – INTERACT´03. Amsterdam, Niederlande: IOS Press, S. 121–128.

[3] Jacob, Robert J. K., 1991: The Use of Eye Movements in Human-Computer Interaction Techniques. What You Look At is What You Get. In: ACM Trans. Inf. Syst. 9 (2), S. 152–169.

[4] Richardson, Daniel C.; Dale, Rick, 2005: Looking to understand: The coupling between speakers' and listeners' eye movements and its relationship to discourse comprehension. In: Cognitive science 29 (6), S. 1045–1060.

[5] Schneider, Bertrand; Pea, Roy, 2013: Real-time mutual gaze perception enhances collaborative learning and collaboration quality. In: Intern. J. Comput.-Support. Collab. Learn. 8 (4), S. 375-397.

[6] Stefik, Mark; Bobrow, Daniel G.; Foster, Gregg; Lanning, Stan; Tatar, Deborah, 1987: WYSIWIS revised: early experiences with multiuser interfaces. In: ACM Transactions on Information Systems (TOIS) 5 (2), S. 147–167.

† http://gepris.dfg.de/gepris/projekt/265182156?language=en

Development of an application on Android for the determination of location through processing, evaluation and advertisement of the angles of inclination from a Shimmer sensor

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The presentation of the inclination angles is realized in the form of a simple game for Android. The playing field is draw with lines and circles. At the correct position of the Shimmer sensor points are counted and entered in a high score table. Evaluating the angles for the horizontal position is made by sensor measurements from an acceleration sensor and for the vertical situation quaternions are converted into Euler angles. Tablets and smartphones can be used as devices.

Key words: *determination of location, angles of inclination, Euler angles, Shimmer, Android*

Introduction

This work arose from the idea to write an application for Android in that the angles of inclination (vertical, horizontal) from a Shimmer sensor are determined as a kind of scale. As motivation this work will be realized as a game, whereby the inclination angles are represented as a laser beam. For getting score, objects can be hit. The collected points are entered after 30 seconds in a high score table.

For the basics to program the Android application, the sample “ShimmerGraph” (Shimmer Android API v2.7) from the company Shimmer is used. Establish the Bluetooth connection with the Shimmer (“Open/Close connection”) and sending the sensor measurements (“Start/Stop stream”) to an Android device have been already exists in the example “ShimmerGraph”.

1. Overview of Shimmer sensors

The Shimmer3 (see Figure 1) comes from a Shimmer3 Electrocardiography (ECG) Development Kit of the company Shimmer. The Shimmer3 is suitable for measuring physiological data such as electromyography (EMG) and ECG. Five ports are available of it can four be used for ECG. A two-channel EMG measurement performed together with a common reference electrode. A right-leg-driver is configurable for common-mode interference rejection. The amplifier gain and the data rate are programmable. An EEPROM storage device detecting and identifies expansion card. The following qualities describe the hardware [1].

Hardware features

- MSP430 microcontroller (24 megahertz, MSP430 CPU)
- Bluetooth device RN-42
- Built-in 2GB micro SD card
- 450mAh lithium-ion battery
- Slim frame and stylish portable case
- Highly configurable for the needs of users/developers

Figure 1: Shimmer3 device with charging station.

Every Shimmer3 ECG device got two accelerometers, a gyroscope and a magnetometer with 3 axes to work in each case. This allows a complete 9 Degrees of Freedom (DoF) application. The acceleration sensors are present with “wide range” or “low noise”. The user can make the configuration of the

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accelerator dependent from the application [2]. For the use in this paper the low-noise acceleration sensor is used.

2. Angle of Ball

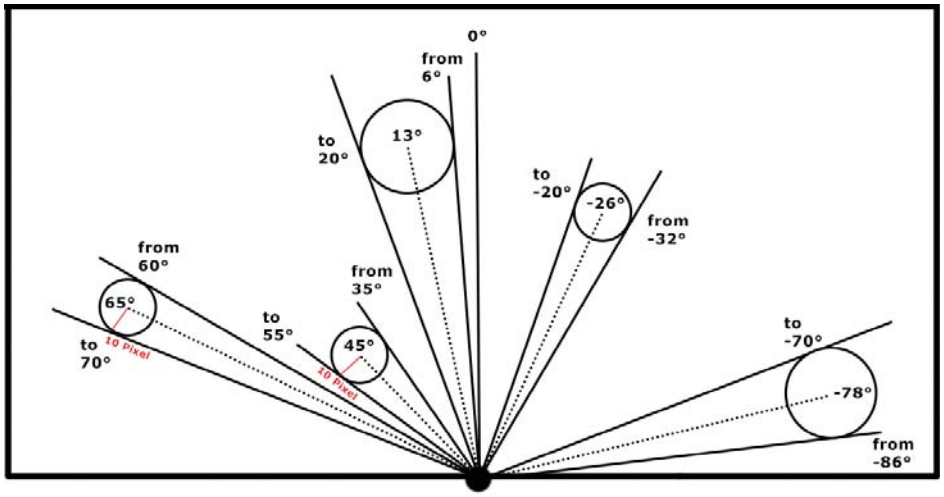

Figure 2: Basic approach for touching the ball.

Touching the ball is simulated about calculating the corners “from” and “to” (see Figure 2). The distance to the middle and the radius from the ball are together decisive for the angle. The radius and the center point from the ball are known. In the period of 180ms the ball radius is reduced. The outer points of the ball are calculated as a function from the radius. For example (radius=4, k=0…3; radius, $k \in \mathbb{N}$):

$$angle_{circle} = \frac{360°}{radius} = 90°$$
$$x = radius * \cos(k * angle)$$
$$y = radius * \sin(k * angle)$$

For each outer point the angle to the middle point is getting calculated. The above-mentioned calculation is carried out to discriminate which is the smallest angle “from” and the largest angle “to”. If the inclination angle from the Shimmer sensor is within the angle of the ball, the value of the ball radius will be added as points to the game score and the ball radius decrements.
If the radius of the ball is less then 3 [pixels], a new position within the playing field and a color (see Figure 3) will be randomly assigned. The distance from the ball to the center point is set to at least 80 [pixels].

Figure 3: The color values of the ball are mapped to the digits 0–9.

3. Positioning

The determination of the inclination angles is carried out for two variants. In both variations the Shimmer sensor get fasten with a loop to the wrist (see Figure 4). At the first variant the arm is kept horizontal (forward) and at the second vertical (downward).

a. Horizontal

In the horizontal state the inclination (left/right bend wrist ±90°) is made over the sensor readings from the acceleration sensor. The sensor data from the Shimmer 3-axis acceleration sensor are transferred in m/s^2. Across the vector relation of the acceleration sensor measurements (see Figure 4), the angles of inclination can be calculated with

$$angle = atan2(X_{Vector}, Y_{Vector})$$

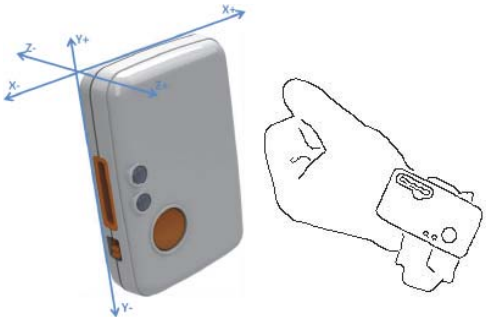

Figure 4: Adjustment of the 3-axis low noise acceleration sensor [2] and Shimmer sensor with strap to wear around the wrist.

[2]. The “atan2” value range results ±180°. Due the application in this paper the angles are cut at ±90°.

b. Vertical

If the arm position is straight down, the acceleration sensors cannot provide any results. Using only the gyroscope is hard to calculate with hasty movements. Following the sample “Shimmer3DOrientationExample” from the company Shimmer, the sensor measurements are converted to quaternions (using low noise accelerometer, gyroscope and magnetometer). A Quaternion is made of a real number (Q_w) and three imaginary numbers (Q_x–Q_z) [3]. Quaternions can be converted into Euler angles. For the sake of completeness, the conversion from the Euler angles (see figure 5)

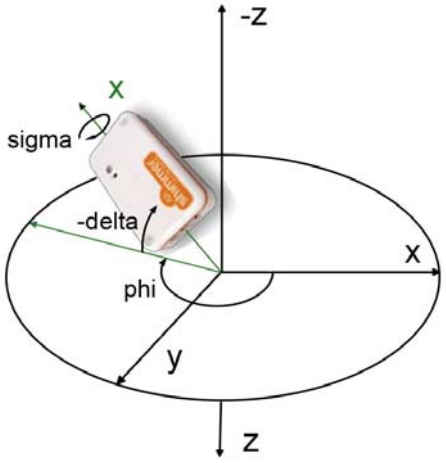

Figure 5: The orientation of the Euler angles at the Shimmer sensor.

$$sigma = atan2(2(Q_w Q_x + Q_y Q_z), 1 - 2(Q_x^2 Q_y^2)),$$
$$delta = \text{asin}\,(2(Q_w Q_y - Q_z Q_x)) \text{ and}$$
$$phi = atan2(2(Q_w Q_z + Q_x Q_y), 1 - 2(Q_y^2 Q_z^2))$$

is calculated to “calibrated” state and “not calibrated” state [4]. The meaning of calibrate is, that by pressing the button “Calibrate” at the Android program “ShimmerGraph” the current angle is set to zero.
The following represent an example for the angle “phi”.

- click button „Calibrate“: phi_{cal} = phi
- not calibrated: phi = phi
- calibrated: phi = phi – phi_{cal}

Due the characteristic of the gimbal lock [5], the aforesaid formula “delta” cannot be use for the horizontal position of the Shimmer sensor. Using the formula “delta” works up to a certain range. Angles greater than 90° and less -90° are wrong interpreted in case of gimbal lock. This occurs when the x-axis collapse with the y-axis (rotation of the wrist at the area ±90°, arm straight forward).
Example: 91°=89°, 92°=88°, … or -91°=89°, -92°=-88°, …

4. Playing Field

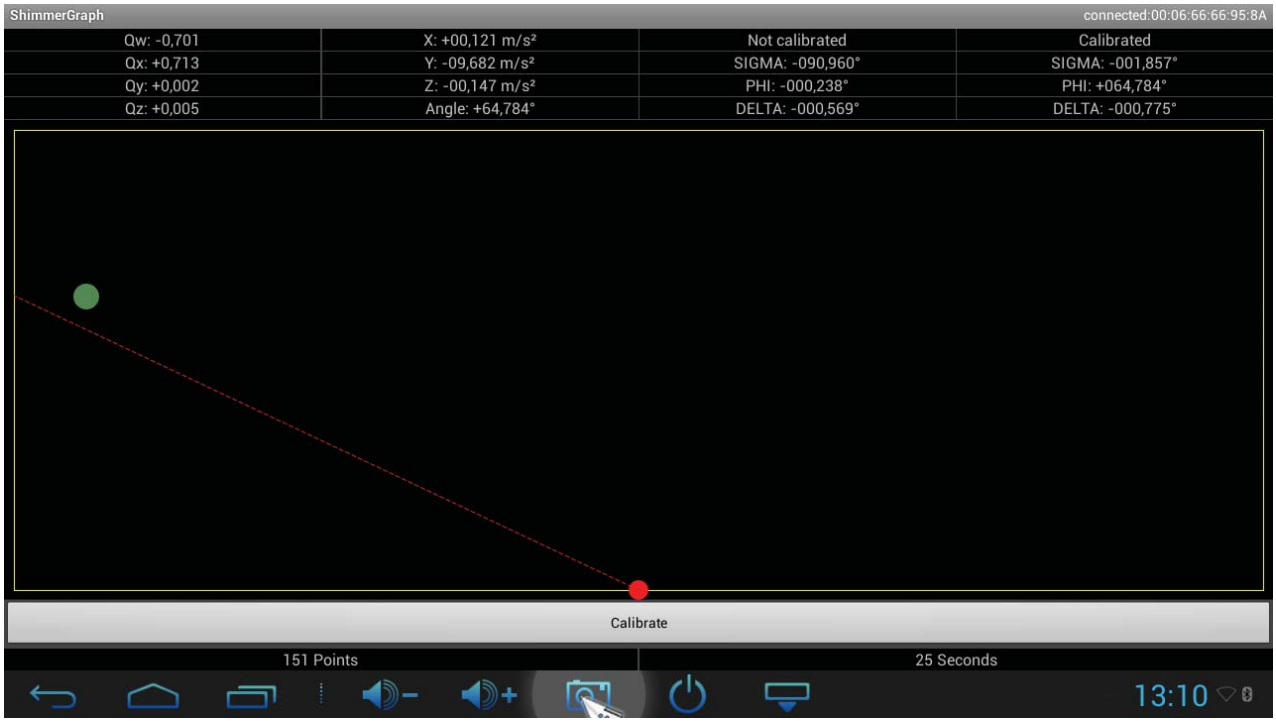

Figure 6: A game is started. For collecting points the inclination angle (horizontal/vertical) from the Shimmer device have to be inside the ball.

Figure 6 shows the graphical interface during a game. In the upper part of the screen, the measurement data from quaternions, accelerometers and Euler angles are shown. In the field “Angle” is the resulting angle of inclination (vertical, horizontal) from the Shimmer. Inside the yellow frame is the game panel. In an active game a red laser with the angle of the variable “Angle” can be seen from the center (red point) to the border. For collecting points the free point in the playing field can be hit, by setting the Shimmer sensor in the right position. At the end of a play round (30 seconds) the collected score is entered in a high score table.

5. Main menu

Across a main menu the items “Open/Close connection”, “Start/Close stream”, “Start game” and “High score” can be called. By pressing the button “Start game” a new game will be started. A connection to the Shimmer, as well as a data stream, must be exists for starting a game. Hitting the menu item “Highscore” will show a high score table. The list can be closed with the button “Finish” or deleted by pressing the button “Reset”.

6. Results and Conclusion

Representing the angles of inclination in the horizontal position is very direct. Also in a steady position some movements are perceived (like tremble). The motion by working with quaternions in the vertical position is pretty smooth. The program runs on smartphones and tablets on Android as of version 4.2.2 (API 17).

To calibrate with an angle “phi” greater than 90° or “phi” smaller then -90° is faulty, since angles are limited from -180° to 180°. To not consider this restriction cause wrong angle announcements, which are to be seen optically in sudden leaps (left to right or right to left).
Examples:

- Button „Calibrate“ is clicked at -120°:
  Then the angle „phi“ supplies an error for -60°, -61°, ..., -90°.
  Following the representation phi“ is falsely set to 180°, 179°, ..., 160°.
- Button „Calibrate“ is clicked at 120°:
  Then the angle „phi“ supplies an error for 60°, 61°, ..., 90°.
  Following the representation „phi“ is falsely set to -180°, -179°, ..., -160°.

In conclusion, the above-described conversions from quaternions to Euler angles are not error free. To use quaternions directly for object positioning will be a nice solution. Following the failure of the calibration at greater/smaller then ±90° would be removed, also the use in the horizontal position could be possibly solve by quaternions.
The use of multiple Shimmer devices could be added. After that, the program can go on to be developed in a multiplayer mode. Collecting points would be separate for each Shimmer device. After perfecting the orientation of the Shimmer device, it would be also feasible to integrate the EMG and ECG sensors.

7. References

[1] Shimmer, Shimmer3 ECG Unit, Features & Benefits, Jan. 2015: www.shimmersensing.com/shop/shimmer3-ecg-unit#features-tab .

[2] Shimmer, 2014: IMU User Guide - Revision 1.3.

[3] Berner, Paul, 2008: Technical Concepts - Orientation, Rotation, Velocity and Acceleration and the SRM. Version 2.0. Sedris. Ch 3.4.10.

[4] Baker, Martin, Eucleadian Space, Maths – Conversion Quaternion to Euler, Feb 2015: http://www.euclideanspace.com/maths/geometry/rotations/conversions/quaternionToEuler/index.htm .

[5] Duvall, Robert C., 2005: www.cs.duke.edu/courses/cps124/fall05/notes/09_rotations/index.html .

Comprehensive Utilization of the AMALTHEA Tool Platform – A Use-Case along with the Parallax ActivityBot

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Since comprehensive embedded system development in context with model-based design and multicore systems comes with a huge amount of different tools and frameworks, we propose an all-in-one solution and outline various benefits along with a Parallax ActivityBot* example. Thereupon, development efforts and costs can be reduced and the product's performance and resource utilization can be increased. Despite illustrating detailed features or models, we provide a remarkable insight into state-of-the-art parallel system development along with a simple and automatic workflow. Furthermore, this paper emphasizes on common characteristics between industrial and academic use of the AMALTHEA* tool platform. We illustrate consistent processes that are subject to development facilitation and henceforth provide an advanced use of the V-Model.

Keywords: *AMALTHEA, Parallax, comprehensive embedded system development*

Introduction

Nowadays, OEMs and suppliers work cooperatively on many different products across smaller applications but also according to huge environments and domains bound to productlines as well as more and more standards and requirements. Because the amount and complexity of development processes increase continuously, efforts are spread widely and address different challenges. Proprietary, commercial and in most cases closed source tooling has been established and company's liberties in choosing or deviating from former tools are very limited. Even worse, companies as well as newly developing working groups in such domains are inhibited in accessing various developments due to missing interfaces and required transformations and integrations. Building tool chains requires significant knowledge, an immense amount of effort and complex integrations. The AMALTHEA tool platform meets these problems and challenges and provides an open-source expandable tool platform that supports various basic standards and necessary features for comprehensive and state-of-the art parallel and embedded system development [8]. This paper focuses on the practical use of the AMALTHEA tool platform and further outlines teaching possibilities along with the Parallax ActivityBot[14]. This example addresses requirements engineering, product line engineering, modeling, parallelization, code generation and tracing. Since each process provides interfaces to the underlying platform and further advanced features that were already subject to publications like [1][2][3], we do not describe each process in detail but rather illustrate them along with the exposed example. Our example advances some aspects of the automotive HVAC (Heating, Ventilation and Air-Conditioning) application presented in [2].

1. Parallax ActivityBot and Application

The Parallax ActivityBot[14] has been chosen as a demonstrator due to its Propeller microcontroller that is based on 8 processing units (cores) and thereby perfectly fits to the multicore development focus of AMALTHEA. Significant parallelization results can be evaluated with regard to single-core execution and parallelization grade along with utilizing different amount of cores (see section 3). The ActivityBot[14]

consists of 2 servo-motors for driving and streering and 2 ultrasonic sensors for detecting obstacles. Via one-wheeled backward driving, the robot is also able to take on-spot turns. The developed application follows a rather simple architecture. The robot can be switched to drive in two different modes via a push button. The one mode lets the robot drive forward until it detects an obstacle and turns into a random direction until the obstacle disappears and the robot continues driving (Figure 1). The other mode is bound to distance calculation in order to retain a distance to a moving obstacle (Figure 2, *USS* defines the ultrasonic sensor value / actual distance to obstacle, and *distance* defines the preconfigured desired distance). Mode one and mode switching is implemented using state chart modeling. Mode two requires data flow based control engineering and is implemented using the Damos [9] framework. Each implementation is subject to model transformation in order to keep the complete system transparent and available based on the AMALTHEA model standards [18]. The next section describes different development stages along with the AMALTHEA tool platform based on the described ActivityBot example.

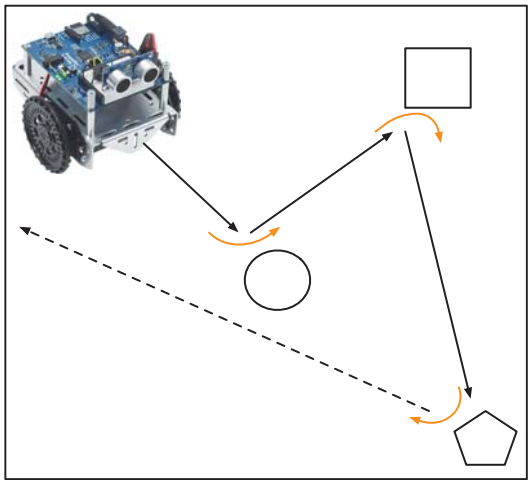

Figure 1 ActivityBot Application Mode 1

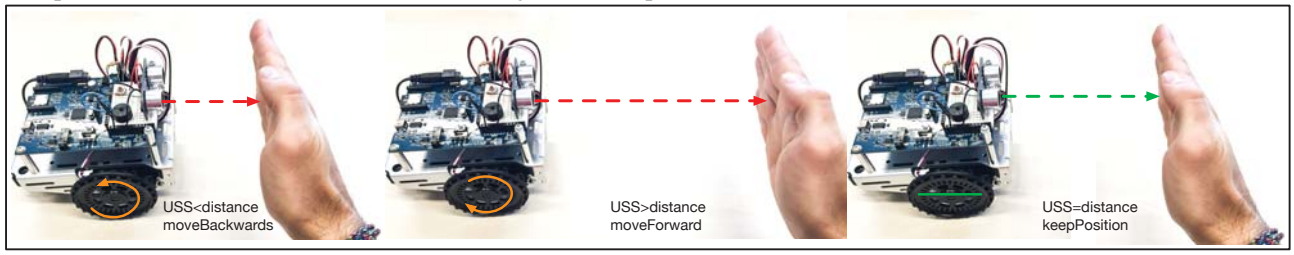

Figure 2 ActivityBot Application Mode 2

2. AMALTHEA4public Processes

The AMALTHEA tool platform provides a comprehensive and model-based system development. Its models are designed for embedded multicore systems but can be used in a much wider domain range due to its generic basis. System development can be eased significantly since various editors and formats as well as importers and exporters are included. Furthermore, manual and proprietary processes can be replaced by standardized AMALTHEA features like partitioning, mapping, workflow definitions and more. However, the open source availability also provides tailoring the platform to any specific tool chain for further adaptations or any special requirements [3]. In [1], an advanced iterative concept of tracing, model augmentation and enhanced parallelization has been published. This concept is subject to ongoing implementations and will improve the current development process' result performance and reduce analysis and evaluation efforts.

2.1. Requirements

A main feature and common basis in collaborative system development is requirements engineering. ProR[16] is the tool of choice within AMALTHEA and supports the open ReqIF[17] format. There are ongoing efforts concerning traceability of requirements throughout the Tool Platform. ProR[16] supports various features to meet challenges related to requirements. For our ActivityBot[14] application, we defined *ID* and *Status* attributes and columns

ActivityBot.reqif | Requirements Document

	ID	Description	Status
1	REQ-1	Multicore Platform	accepted
1.1	REQ-1a	The Hardware must posses at least two processing units	accepted
2	REQ-2	Control Engineering	accepted
2.1	REQ-2a	The application must contain at least one dataflow model	accepted
2.2	REQ-2b	Dataflow models must be modeled with the Damos framework	accepted
3	REQ-3	State Chart engineering	accepted
3.1	REQ-3a	The application must contain at least one statechart model	accepted
3.2	REQ-3b	State charts must be implemented with the Yakindu SCT framework	accepted
4	REQ-4	Application	accepted
4.1	REQ-4a	[REQ-2a] and [REQ-3a] must both be implemented within the application	accepted
4.2	REQ-4b	Actuators and Sensors must be accessed	accepted
5	REQ-5	ActivityBot	accepted
5.1	REQ-5a	The robot must interact with its physical environment	accepted
6	REQ-6	Parallelization	new
6.1	REQ-6a	Partitioning must be performed	new
6.2	REQ-6b	Mapping must be performed	new
7	REQ-7	Variant modeling shall be performed	rejected
8	REQ-8	[REQ-2b] and [REQ-3b] must be translated into the AMALTHEA model	in progress

Figure 3 ActivityBot Application Requirements

for the requirements document shown in Figure 3.

2.2. Product lines

Productlines are part of the AMALTHEA tool platform but are not scope of our ActivityBot[14] application since only a single product is developed. This fact is also illustrated by the rejected requirement REQ-7 in Figure 3. Publications like [2], [3] or [15] describe benefits, features and possibilities of the productline engineering tool in AMALTHEA on a more detailed level.

2.3. Modeling

This is probably the most complex but also the most interesting development process within the Tool Platform. The Parallax ActivityBot[14] application features both state based and dataflow based models that can be developed in separate editors (Yakindu SCT[10] and Damos[9]) and transferred to the common AMALTHEA model. Further functions or processes can additionally be modeled via the integrated AMALTHEA editor and combined with the models created by different frameworks e.g. Damos[9]. Each of these however address only the AMALTHEA software model. It is an established method to model further system properties in the embedded system domain. These properties concern hardware, operating system, constraints, events and more information.

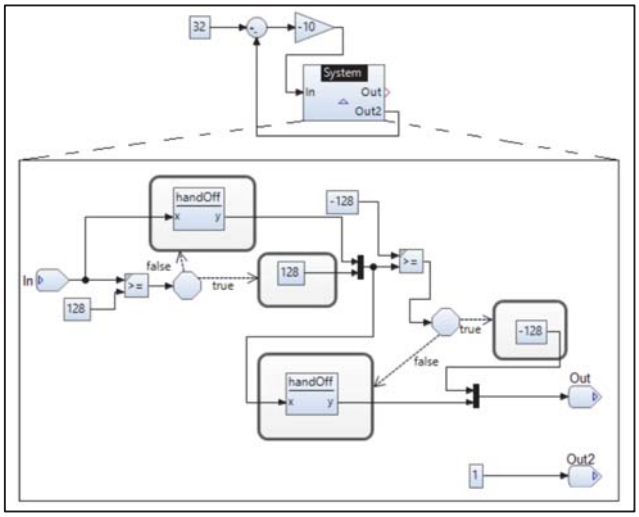

Figure 4 Damos diagram – FollowTheObject Mode2

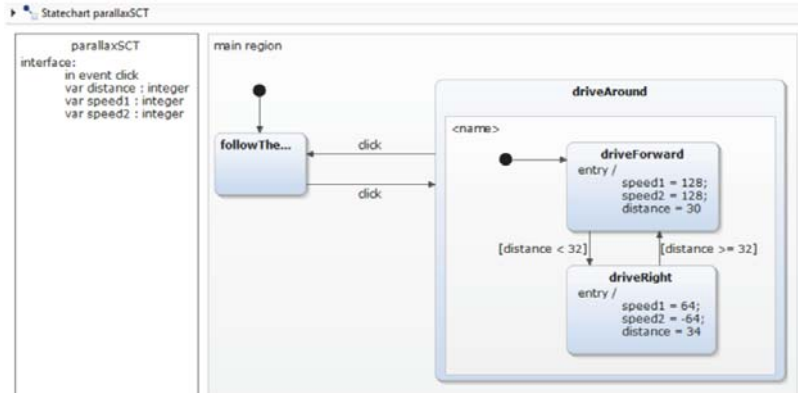

Figure 5 Yakindu SCT state chart - mode switching and mode1

Figure 4 shows the modeled data flow diagram of the application's mode 2. The constant "*32*" at the very top of the figure defines the reference variable of the desired ActivityBot's distance to an obstacle. The *-10 gain* block subsequent to the subtraction of the desired and actual (sensor) distance values ensures that the robot drives forwards and backwards. The *System* subsystem derives the servo-motor values to control the rotbot's speed (must be in range *-128<speed<128*).

The robot's *mode1* is modeled with Yakindu SCT[10] as shown in Figure 5. It starts with the *followTheObejct* state implemented in Figure 4. Via a button push, *mode1* gets activated and the robot runs in the *driveAround* state. For reasons of simplicity, the example only shows the *driveRight* state, activated as soon as an object is detected by the ultrasonic sensors and the distance to that object is below the value *32*.

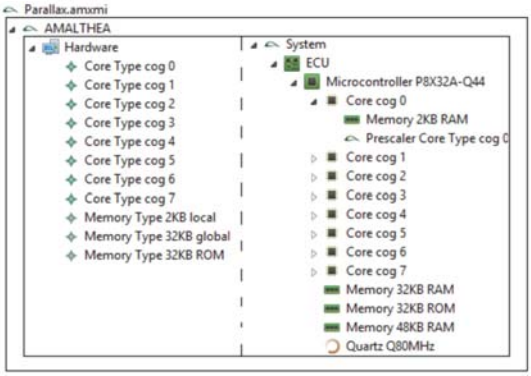

Figure 6 HW model of the ParallaxPropeller

The hardware model has been manually created and is shown in Figure 6. Such information is required for the previously mentioned mapping process. The mapping model is then used for the code generation process in order to configure the operating system and utilize given resources

efficiently. The software model is filled with information given from the frameworks in Figure 4 and Figure 5. The software model can be extended manually by any data that is necessary for the application on an abstract level. Specific code can be referenced by *CustomProperties* and additional information like instructions, deviations, memory accesses and more can be added or partially derived from the existing Yakindu SCT[10] or Damos[9] models. Since parallelization processes work automatically and just need some configuration according to the user's needs, significant effort can be saved along with reducing complexity and costs. Moreover, eclipse's modeling workflow engine 2* can be used in order to define complete workflows including read, write, parallelization and configuration processes.

2.4. Parallelization

Detailed descriptions of the parallelization methodologies have been published in [4], [5], [6] and [7]. The Parallax Propeller provides eight homogeneous cores (denoted as cogs) and thereby a relatively great amount of parallelization potential for the embedded domain. The architectural design is illustrated in Figure 7.

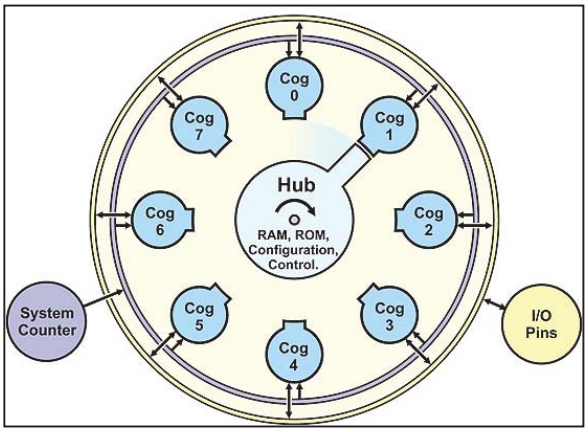

Figure 7 Parallax Propeller Multicore Access

The first parallelization step is defined by the initial identification of tasks. In our context, this process is called partitioning and works with software models only. The process can be subdivided into 5 configurable steps:

1. Activation analysis (grouping runnables by their activation reference)
2. Label access analysis (identifying runnable dependencies)
3. Cycle elimination (creating a directed acyclic graph)
4. Independent graph identification (separating independent graphs)
5. Critical Path- or Earliest Start Scheduling partitioning (creating *ProcessPrototypes* via cutting graphs and thereby forming partitions that can be executed in parallel)

The previously generated software model is augmented with the constraints model featuring *RunnableSequencingConstraints* (dependencies) and further *ProcessPrototypes* that define tasks that can be executed in parallel. Different partitioning configurations create different amount of partitions.

Subsequently, the mapping process can be performed based on the partitioned model. This feature further takes the hardware and operating system model into account and calculates a pareto-optimal mapping based on ILP programming and genetic algorithms. In other words, this phase maps tasks to cores on the hardware. The mapping result will be stored in a mapping model, that will be used for the subsequent code generation process in order to configure schedulers, OS services and realize the mapping results.

2.5. Code Generation

Source code can either be generated via integrated code generators of modeling frameworks like Damos[9] or Yakindu SCT[10] or referenced by custom properties in the software model. Merging of the source code depends on the used hardware environment and is subject to manual methods in most cases. Our ActivityBot example contains code from Damos, code from Yakindu SCT[10] and manual code for library inclusion and hardware specific configuration. Some classes were implemented in order to merge the code fragments, compile them and run them on the hardware via the *SimpleIDE* [13].

2.6. Tracing

Tracing in terms of hardware execution of the modeled system has been tracked in AMALTHEA along with the BTF[12] format and Freescale's MPC5668G microcontroller[2]. A concept that is subject to upcoming implementations has been developed for the purpose of utilizing tracing iteratively to improve parallelization i.e. system performance. Detailed information can be found in [1]. Concrete hardware traces were generated in [2] but were not feasible according to the ActivityBot application. In [2], the hardware supported various

peripherals in order to ease tracing along with saving trace data into a buffer and transmit it as soon as it reached a predefined size to an external memory. Dedicated trace memory and interfaces like SPI made this approach possible. The ActivityBot does not provide the same peripherals such that a different tracing mechanism is required to be established. An approach to use the microSD card along with software traces is currently under investigation. The ActivityBot trace approach shall be subject to a new library, that provides easy trace-point integration bound to BTF trace generation.

3. Evaluation

Figure 8 outlines a comparison of single and multicore execution in terms of time dependent of the ActivityBot's speed. The time values represent the amount of time the ActivityBot requires to come to a standing position in front of an obstacle after starting from a predefined distance. For this measurement, the ActivityBot was driving in mode 2.

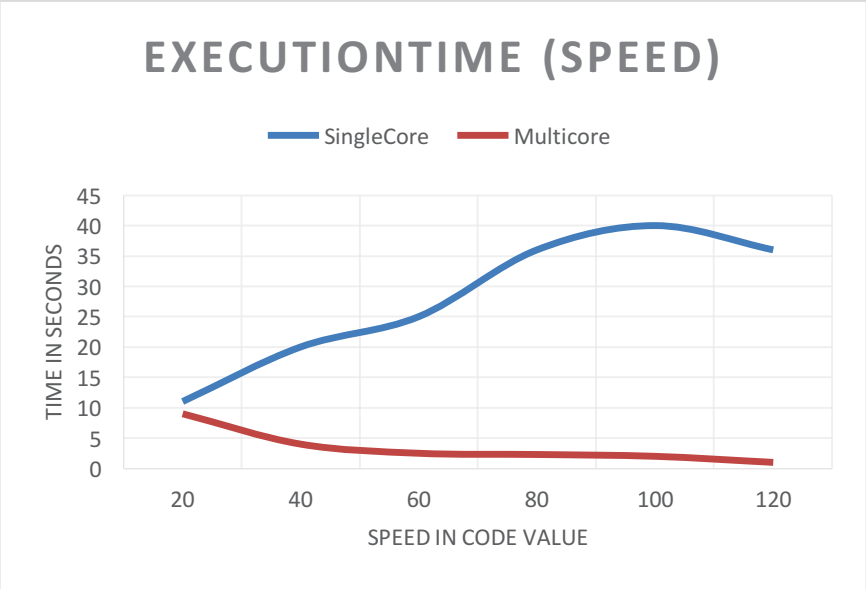

Figure 8 Executiontime (Speed) diagram for mode2

Obviously, the execution time increases with speed according to single core utilization. This is affiliated to the fact that the ultrasonic sensor is retrieved between relatively long intervals. Consequently, responses and interaction between sensors and actuators are delayed and the single core execution lasts longer. Additionally, by a speed of "80", the ActivityBot is even not able to stop in front of an obstacle. With utilizing more cores, the execution time reduces with the ActivityBot's speed. This clearly shows the advantage of multicore execution and the successful application parallelization via AMALTHEA.

4. Conclusion and outlook

Our example ActivityBot application illustrated the comprehensive system development along with AMALTHEA features, models, activities and possibilities. The combination of open standards, editors, model transformations, frameworks, the open and expandable model repository, parallelization features and workflow integration provide a flexible and generic approach for state-of-the-art embedded multicore-system development.
Evaluations reveal the system's performance improvement and greater application responses with regard to single core execution compared with the utilization of up to eight cores.
Especially the tracing feature is subject to upcoming work with regard to trace generation and trace analysis. Initial investigations address writing BTF [12] traces onto the mircoSD card via a new library. Whether additional trace-points must be added to the existing code, a separate cog (core) is used for trace generation and saving or if an independent monitor without any influence to the actual system's execution can be used are just some of the challenges.

5. Acknowledgement

The authors would like to express their appreciation to the AMALTHEA4public consortium for sharing expertise, experience and knowledge. Special thanks to the ITEA2 committee and the German *Bundesministerium für Forschung und Bildung* (BMBF) for making this study possible by providing funding to AMALTHEA. The project was funded within the ITEA2 Call 4, 09013. The funding of BMBF was granted with Förderkennzeichen 01|S11020E & 01|S14029K.

6. References

[1] Höttger, R., Igel, B. (2015): Utilizing Vector Clocks in an Iterative Tracing Approach for Distributed Embedded Systems at 18th International Workshop on Software and Compilers for Embedded Systems, June 2015, St. Goar

[2] Krawczyk, L., Fruhner, D., Höttger, R., Wolff, C., Brink, C. (2015): AMALTHEA - Eine durchgängige Entwicklungsplattform für die modellgetriebene Entwicklung automobiler eingebetteter Systeme at 10. Paderborner Workshop Entwurf mechatronischer Systeme, April 2015, Heinz Nixdorf MuseumsForum, Paderborn

[3] Wolff, C., Höttger, R., Igel, B., Kamsties, E., Krawczyk, L., Lauschner, U., Brink, C. (2015): Automotive Software Development with AMALTHEA at 4th International Scientific Conference on Project Management in the Baltic Countries, April 2015, Riga, Latvia

[4] Höttger, R., Igel, B., Krawczyk, L. (2015): Modelbased Automotive Partitioning and Mapping for Embedded Multicore Systems at XIII International Conference on Parallel, Distributed Systems and Software Engineering, January 2015, Istanbul, Turkey

[5] Fruhner, D., Höttger, R., Krawczyk, L., Köpfer, S. (2014): Model Based Automotive Software Development with AMALTHEA at International Research Conference 2014, June 2014

[6] Höttger, R., Igel, B., Kamsties, E. (2014): Vector Clock Tracing and Model Based Partitioning for Distributed Embedded Systems at International Journal of Computing, January 2014

[7] Höttger, R., Igel, B., Kamsties, E. (2013): A Novel Partitioning and Tracing Approach for Distributed Systems Based on Vector Clocks at 7th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS'2013), September 2013, Berlin, Germany

[8] Höttger, R., Fruhner, D., Igel, B., Wolff, C. (2012): Managing an EU-funded Research Project – Case Study on AMALTHEA at International Research Conference 2012, June 2012, Dortmund, Germany

[9] Damos – Dataflow-oriented development environment (Online), Available: https://www.eclipse.org/damos/

[10] Yakindu Statechart Tools (Online), Available: http://statecharts.org

[11] Eclipse MWE2 – Modeling Workflow Engine 2 (Online), Available: http://help.eclipse.org/luna/index.jsp?topic=%2Forg.eclipse.xtext.doc%2Fcontents%2F118-mwe-in-depth.html

[12] BTF Trace Format Specification (Online), Available: https://wiki.eclipse.org/images/e/e6/TA_BTF_Specification_2.1.3_Eclipse_Auto_IWG.pdf

[13] SimpleIDE - Propeller C development environment (Online), Available: http://learn.parallax.com/propeller-c-set-simpleide

[14] Parallax ActivityBot featuring Parallax Propeller Microcontroller (Online), Available: https://www.parallax.com/product/32500 , Propeller Datasheet: https://www.parallax.com/sites/default/files/downloads/P8X32A-Propeller-Datasheet-v1.4.0_0.pdf

[15] Brink, C., Sachweh, S., Hirsch, M.: Kombinierte Entwicklung und Konfiguration von Hardware- und Software-Produktlinien unter Berücksichtigung von deren Abhängigkeiten at 11th Dagstuhl-Workshop Model-Based Development of Embedded Systems (MBEES), March 2015, Dagstuhl, Germany

[16] ProR – Requirements Engineering Platform (Online), Available: http://eclipse.org/rmf/pror/

[17] ReqIF – Requirements Interchange Format (Online), Available: http://www.omg.org/spec/ReqIF/1.1/

[18] AMALTHEA model descriptions – AMALTHEA Tool Platform Help Documentation (Online), Available: http://www.amalthea-project.org/index.php/downloads

PRACTICAL IMPLICATIONS OF THE CRITICAL FIELD APPROACH

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Key words: project scheduling, risk management, critical field, PERT.

Abstract: Since years it is obvious that the PERT approach to introduce uncertainties into the time management process evince very severe disadvantages in relation to the alternative given by Monte Carlo simulation ("critical field approach"). In this contribution we do not want to focus on these disadvantages, but rather want to show further advantages of the Monte Carlo approach, especially to gain more detailed information and the possibility to use further well-known statistical tools. The results of the application of these statistical tools can lead to very specific implications in the scheduling process in practice.

1 Introduction

Since more than fifty years there is mostly only one method mentioned in the common textbooks about project management that should be used to handle insecurities in the scheduling process, namely PERT (Program Evaluation and Review Technique) (c.f. [1], [2], [3], [4], [5]) . Unfortunately because this method relies heavily on the critical path method, it entails some disadvantages. The most severe point that has to be mentioned is the fact that PERT systematically underestimates the real risk (c.f. [6], [7]). But there is a quite powerful alternative that overcomes most of the disadvantages of PERT, the Monte Carlo simulation (c.f. [8]). In this contribution we do not want to focus on the disadvantages of PERT, but more concentrate on additional advantages of the Monte Carlo simulation**.**
PERT reduces the whole stochastic scheduling model to the expected values, then solves this with the critical path method (CPM) and afterwards pretends to return to the stochastic approach again by adding some stochastic element – like putting the cherry on the top of a cake (fig. 1). This stochastic element is the consideration that – according to the central limit theorem – the convolution along the critical path will lead to a normal distribution and that we therefore just have to know the mean and the standard deviation. But the problem is situated in the fact that if you once left the stochastic model, you are in a total different environment because in the real (stochastic) world there is no unique critical path. If you try to reduce the stochastic world to its expected values, you will get drowned in a lake with an average depth of 5 inches.

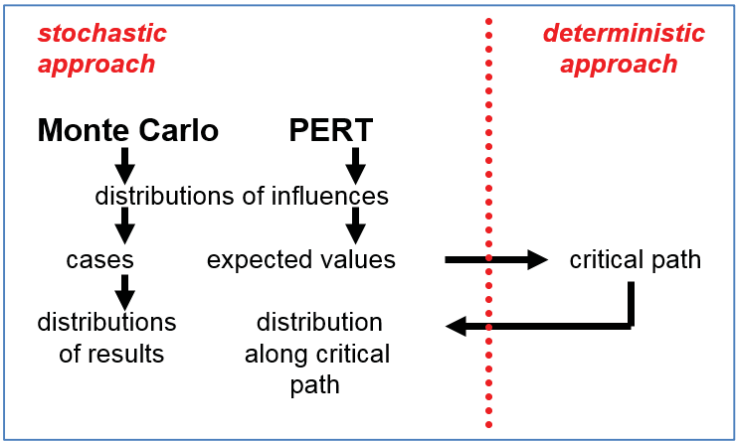

Fig. 1: Stochastic versus deterministic approach

To illustrate this, we take the following example of a project (fig. 2) with some activities, predecessor/successor relations and uncertain durations. These uncertain durations are estimated by using the popular three-point-estimation method: optimistic duration (OD), most probable duration (MD), and pessimistic duration (PD).

Activity	Predecessors	OD	MD	PD
A	-	2	3	4
B	-	3	6	9
C	-	2	5	10
D	-	4	6	9
E	A, B, C	3	7	10
F	C, D	2	7	9
G	E	2	3	4
H	E, F	3	6	8
I	F	3	5	9
J	F	2	7	10
K	G, H, I	2	6	8
L	I, J	3	5	8

Fig. 2. A fictitious project plan

According to the PERT approach, which assumes that the three-point-estimates determine beta distributions, this will lead to the critical path shown in fig. 3, with a mean of 24.5 and a standard deviation of 2.128 for the total duration of the project.

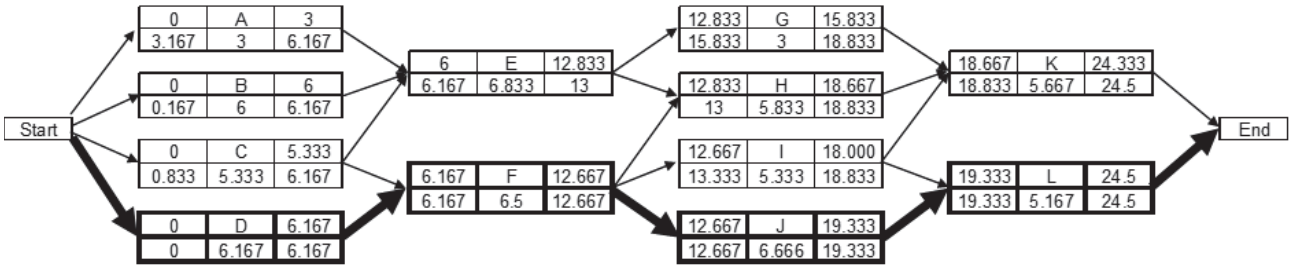

Fig. 3. The critical path due to PERT

In contrast to that, we perform a Monte Carlo simulation - assuming exactly the same beta distributions for the durations of the individual activities like PERT. The 10,000 created cases of this simulation then lead to a variety of critical paths (fig. 4). It is obvious that the critical path that was assumed by PERT is quite different from this "critical field" that we found out of the Monte Carlo simulation. Even more interesting than the non-uniqueness of the critical path is that the Monte Carlo simulation delivers a lot more information (like the starting/finishing dates, the buffers etc. for each activity) for all the 10,000 cases.

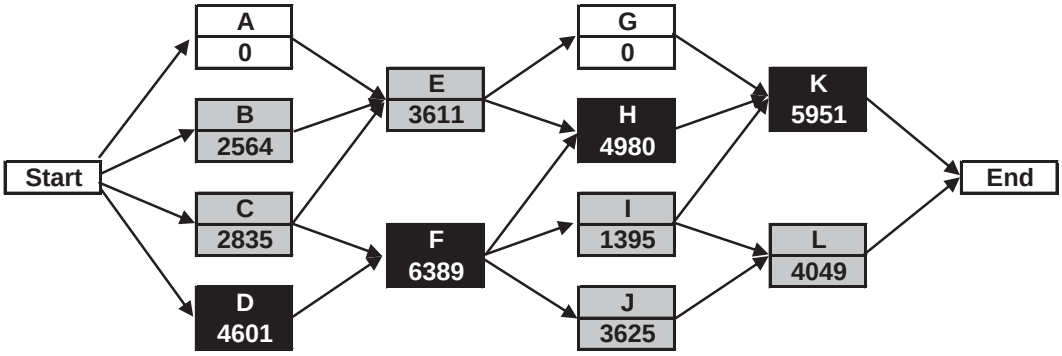

Fig. 4. The critical field (number of times that a node is critical)

2 Densities of the Buffers

The Monte Carlo simulation handles uncertainties right from the beginning in full completeness. This encompasses that all the involved parameters like buffers, earliest/latest start and earliest/latest end of the activities, final end of the project etc. are taken to be random variables. Therefore it is possible to analyze the shape of the densities, their extremes, parameters like skewness, variance, mode, median etc. with statistical methods. These newly gained information may give the management deeper insight when considering the probabilities of realization of these parameters in practice. Therefore an impression of the densities of the buffers might be interesting, let it be of activities that are never critical like activity G (fig. 5) or that are highly critical like activity K (fig. 6). Of course it is also possible to calculate the moments of these distributions (fig. 7). It can be noticed that all the distributions of the buffers are right skewed, which can be also found in a lot of risk management applications.

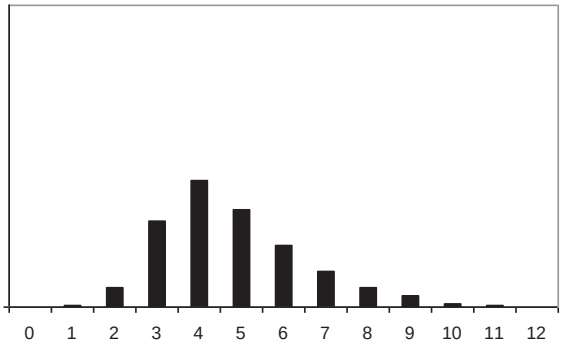

Fig. 5. Distribution of the buffers of activity G

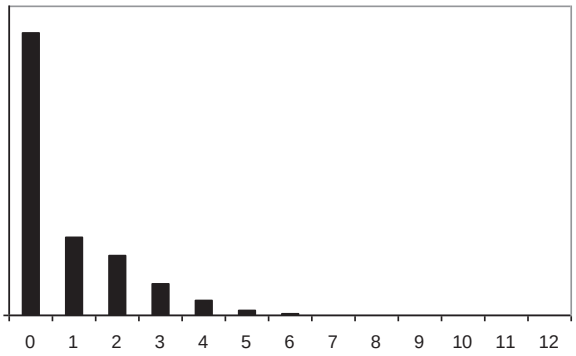

Fig. 6. Distribution of the buffers of activity K

	buffers		
activity	mean	standard deviation	skewness
A	5.35	1.79	0.77
B	0.25	2.01	0.83
C	1.57	1.35	0.50
D	1.11	1.36	1.24
E	1.80	1.88	0.99
F	0.71	1.18	1.75
G	4.80	1.76	0.81
H	1.07	1,36	1.25
I	2.32	1.58	0.45
J	1.69	1.81	1.06
K	0.83	1.23	1.54
L	1.45	1.67	1.19

Fig. 7. The moments of the distributions of the buffers

3 Correlations

We can also calculate the dependencies between the above mentioned parameters by means of correlations. With the help of the correlation matrix it is not only conceivable to detect the dependencies between the end of the different activities and the final end of the whole project, but also between the individual activities itself. This offers opportunities for a more detailed scheduling even of activities that bear a relatively low probability of becoming critical. Fig. 8 shows the correlation matrix between the earliest finishing dates of the individual activities, in addition to the final end of the project. We can hardly find any significant negative correlations. This is more or less a consequence of the fact that the earliest finishing date is “pushed” through the project. Fig. 9 shows with different shadings (the darker, the higher the correlation) that of course the correlation between the earliest ends of the activities and the final end of the project increases, the closer the activity is to the end. But comparing fig. 9 with fig. 4 you realize that we can rediscover here the critical field.

The analysis of the correlation matrix leads to more interesting details: Although activities J and K are quite "far away" from each other within the project, we find a correlation of 0.332. The reason for this is that they have a common predecessor (activity F) that is highly critical. We would have expected a high correlation if both would be direct successors (look at the correlation of 0.609 between I and J), but that the correlation between J and K is still that high is not that self-evident. The similar is true for activities G and H: Because of the common predecessor E, they have a correlation of 0.584. In the PERT approach we would not have noticed this, especially because G is never critical. But what if you have to apply in activity G a resource with a very limited capacity? Then you are quite interested in the time restrictions of this resource. Here also the correlation between activity G and C is still 0.314.

	A end	B end	C end	D end	E end	F end	G end	H end	I end	J end	K end	L end	Final end
A end	1	-0.002	0.003	0.012	-0.007	-0.009	-0.004	-0.011	-0.012	0.000	-0.011	-0.010	-0.012
B end		1	0.011	-0.006	0.438	0.001	0.427	0.253	0.004	-0.002	0.198	0.000	0.162
C end			1	-0.006	0.322	0.303	0.314	0.268	0.238	0.220	0.217	0.208	0.241
D end				1	-0.015	0.409	-0.017	0.193	0.338	0.299	0.188	0.293	0.242
E end					1	0.127	0.976	0.598	0.111	0.101	0.458	0.094	0.390
F end						1	0.124	0.486	0.821	0.736	0.452	0.716	0.587
G end							1	0.584	0.108	0.098	0.446	0.091	0.381
H end								1	0.405	0.361	0.779	0.350	0.706
I end									1	0.609	0.447	0.658	0.535
J end										1	0.332	0.872	0.610
K end											1	0.338	0.819
L end												1	0.673
Final end													1

Fig. 8. The correlations of the finishing dates of the activities

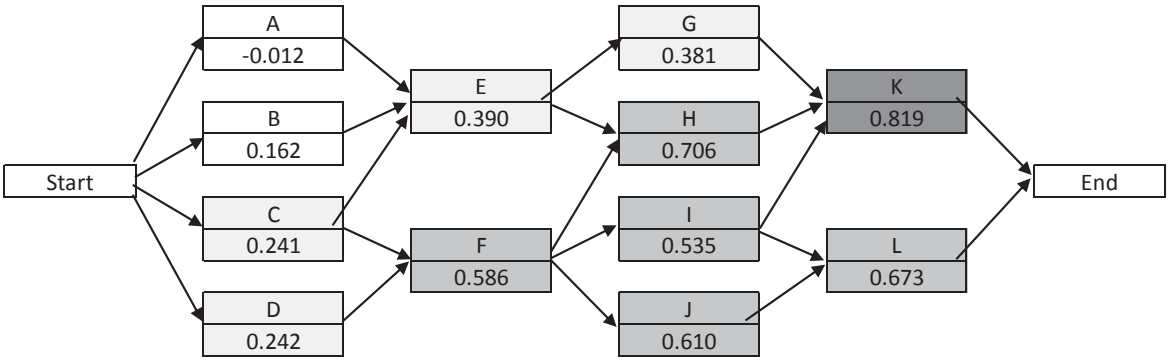

Fig. 9. The correlations of the earliest ends of the activities and the final end of the project

If we look at the correlations of the buffers (fig.10), we notice that now we find positive and negative values (different shadings for values less than -0.3 and larger than 0.8). On the first sight it is hardly possible to detect a clear pattern in these correlations. But if we perform a factor analysis (principal component analysis with varimax rotation), we get three factors (fig.11 and fig.12). These three factors explain 80% of the variance of the 12 buffer variables. If we look at these three factors in our critical field, we can detect that the critical field is segmented in two main parts (the upper and the lower part) and one remaining activity (namely C). The upper part explains about 40%, the lower part about 30%, and the activity C (which is quasi in the bifurcation of the two parts) the remaining 10%. By this we get a quite plausible interpretation of the critical field, which is totally different to the critical path that was suggested by PERT (fig.3).

Correlations

	buffer A	buffer B	buffer C	buffer D	buffer E	buffer F	buffer G	buffer H	buffer I	buffer J	buffer K	buffer L
buffer A	1	0,831	0,049	-0,158	0,832	-0,323	0,703	0,723	-0,052	-0,341	0,643	-0,363
buffer B	0,831	1	-0,066	-0,263	0,914	-0,44	0,791	0,74	-0,139	-0,408	0,651	-0,438
buffer C	0,049	-0,066	1	-0,158	0,133	0,114	0,136	0,015	0,078	0,077	0,015	0,082
buffer D	-0,158	-0,263	-0,158	1	-0,407	0,834	-0,335	-0,309	0,493	0,597	-0,268	0,657
buffer E	0,832	,914**	0,133	-0,407	1	-0,455	0,863	0,805	-0,127	-0,431	0,713	-0,462
buffer F	-0,323	-0,44	0,114	0,834	-0,455	1	-0,372	-0,365	0,593	0,715	-0,316	0,784
buffer G	0,703	0,791	0,136	-0,335	0,863	-0,372	1	0,614	0,002	-0,308	0,587	-0,328
buffer H	0,723	0,74	0,015	-0,309	0,805	-0,365	0,614	1	0,014	-0,441	0,913	-0,466
buffer I	-0,052	-0,139	0,078	0,493	-0,127	0,593	0,002	0,014	1	0,267	0,188	0,403
buffer J	-0,341	-0,408	0,077	0,597	-0,431	0,715	-0,308	-0,441	0,267	1	-0,463	0,945
buffer K	0,643	0,651	0,015	-0,268	0,713	-0,316	0,587	0,913	0,188	-0,463	1	-0,451
buffer L	-0,363	-0,438	0,082	0,657	-0,462	0,784	-0,328	-0,466	0,403	0,945	-0,451	1

Fig. 10. The correlations of the buffers

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6,071	50,590	50,590	6,071	50,590	50,590	4,985	41,544	41,544
2	2,422	20,182	70,771	2,422	20,182	70,771	3,496	29,134	70,678
3	1,117	9,311	80,083	1,117	9,311	80,083	1,129	9,404	80,083
4	,937	7,807	87,890						
5	,452	3,764	91,654						
6	,445	3,708	95,362						
7	,198	1,651	97,013						
8	,126	1,053	98,066						
9	,102	,846	98,912						
10	,056	,468	99,380						
11	,041	,344	99,724						
12	,033	,276	100,000						

Extraction Method: Principal Component Analysis.

Fig. 11. Results of a factor analysis of the distributions of the buffers

Rotated Component Matrix[a]

	Component		
	1	2	3
buffer A	,876	-,086	,019
buffer B	,888	-,201	-,054
buffer C	,055	,033	,936
buffer D	-,173	,855	-,250
buffer E	,917	-,249	,156
buffer F	-,267	,903	,059
buffer G	,828	-,143	,217
buffer H	,886	-,162	-,082
buffer I	,156	,724	-,060
buffer J	-,358	,757	,220
buffer K	,857	-,101	-,123
buffer L	-,356	,827	,192

Fig. 12. The rotated component matrix

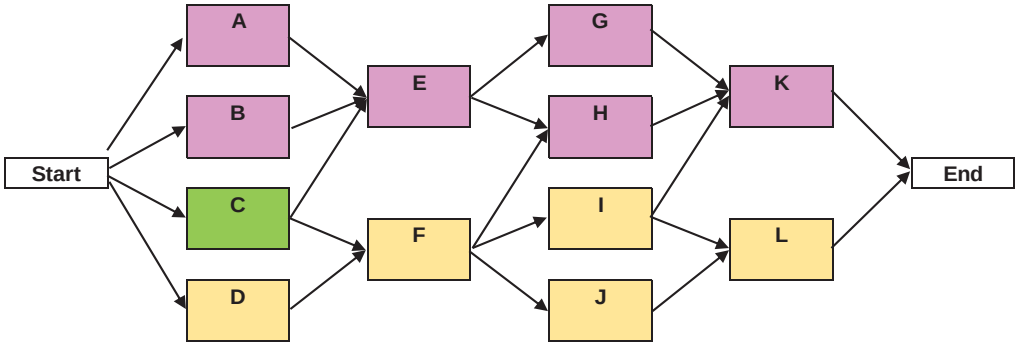

Fig. 13. The segmentation of the critical field

4 Results and Conclusion

If you look into textbooks you will still find that PERT is the most propagated technique to handle uncertainties in the scheduling of projects. Besides the fact that PERT unfortunately systematically underestimates the risk, it is not really a technique that works with stochastic elements. It rather reduces all the insecurities to the expected values and then treats the whole model as if everything would be deterministic, by applying the critical path method (CPM). Only in the end there is some tiny stochastic element by calculating the convolution along this critical path.
The considerations explained in this contribution allow much deeper insights into the structure of the underlying project. The Monte Carlo approach generates stochastic variables for all the parameters in the model. The practical implications shown in this contribution should only give an impression of some new opportunities that can be considered. Perhaps this approach can be transferred to other already well-known methods in project management (e.g. critical chain approach).

5 References

1. Fazar, Program Evaluation and Review Technique, The American Statistician, Vol. 13, No. 2, 1959
2. PMI (ed.): A guide to the project management body of knowledge, (PMBOK®Guide) PMI 2010
3. Kerzner: Project Management, John Wiley & Sons, Hoboken, New Jersey, 2009
4. Taylor: Introduction to Management Science, Pearson, Prentice Hall. 2010
5. Maylor: Project Management, Pearson, Prentice Hall. 2010
6. Tysiak: From Critical Path to Critical Field, in: Project Management Development – Practice and Perspectives – Proceedings of the First International Scientific Conference on Project Management in the Baltic Countries, University of Latvia, Riga, 2012
7. Tysiak: Recent Developments in Risk Management in Projects, Proceedings of the Seventh IEEE Conference on Intelligent Data Acquisition and Advanced Computing Systems (IDAACS'2013), IEEE Service Center Piscataway, 2013
8. Tysiak: A Deeper Insight in Some Effects in Project Risk Management, International Journal of Computing, Vol. 13, Issue 4, 2014

The Project Scorecard as a Steering Tool for the Implementation of a Modular Design Strategy

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Keywords: project, Project Scorecard, KPI

Abstract: Strategically important projects require systematic and efficient performance monitoring throughout the entire duration. The Project Scorecard is a comprehensive instrument that can be used for the performance monitoring throughout the entire duration of the strategically important projects. In addition to monitoring the value drivers of the project success, the Project Scorecard reflects the project status and provides the information about the project outcomes, and matches the project with the business strategy of the organization. At the same time, the Project Scorecard is used for the goals agreement with the project management and for tracking from the outset, whether the project is going in the direction of the strategic success. It provides a different approach to the project performance and can be perceived as an effective tool for a manager.

1. Introduction

The implementation of the projects is seen as the way organizations can react to the challenges in the business environment, implement strategy, achieve competitive advantage, change, and innovate [13]. "Most projects are part of the strategic management of their organization, and they should be assessed based on their contribution to the overall business results, and not only on their ability to meet time, budget, or performance goals. Furthermore, project benefits can have many forms; some may be immediate, and others may be realized only later"[13].

Managers nowadays recognize the significance of performance measurement and its influence on the goals' achievement. Hence, effective performance measurement has to be an essential part of the management process [5]. For all projects it is necessary to understand which project goals should be achieved and how the fulfillment of these goals can be measured. Moreover, the contribution of the specific project to the overall company strategy has to be estimated and understood. To do so, it is necessary to have a comprehensive instrument that allows to measure project performance [12].

2. The Project Scorecard Concept

The Project Scorecard connects project performance and company or business division strategy and ensures that there is no gap between them. In the process of the Project Scorecard development the approved concepts of the Balanced Scorecard were adopted and adjusted to the specific needs of the project [12]. The Project Scorecard is intended to avoid ineffective project management and keep the project managers accountable from the project beginning and till the end of the assignment. The purpose of the Project Scorecard is to assist in keeping the project on target by means of measurements and evaluations [11].

In the process of planning the Project Scorecard development, the following issues have to be taken into account [11]:

- various levels of project objectives
- estimated results that can be enquired from the project
- results that were achieved by previous projects
- clear focus on the results of from the project beginning
- specified project requirements
- estimation of business impact and job performance needs

- development of an effective evaluation plan
- plan to monitor long-term effects of the project
- method to provide feedback throughout the process.

As illustrated in Figure 1, the Project Scorecard "provides a systematic approach to project evaluation and emphasizes that this is a logical, systematic process that flows from one step to another" [11]. As the balanced approach to project performance evaluation tends to be the most fruitful, the Project Scorecard requires the usage of soft data that is difficult to quantify and hard data that can be easily expressed in figures with the aim to gather both types of data [11].

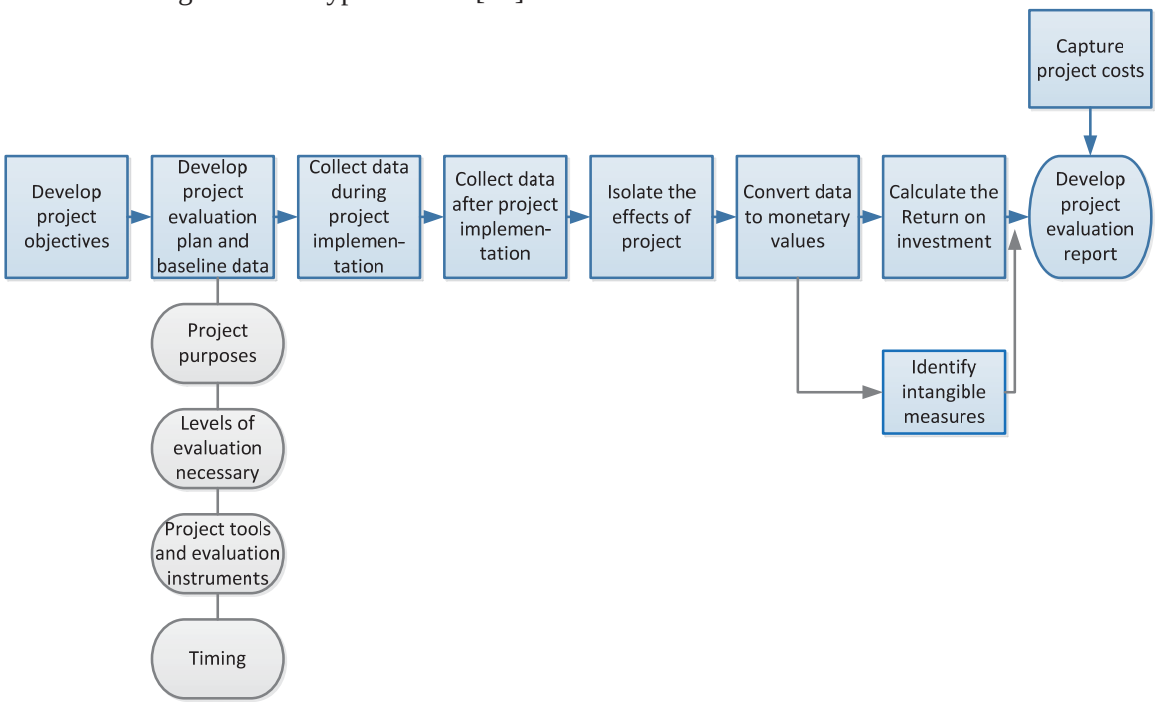

Figure 1: The Project Scorecard model [11]

As it was previously mentioned, the Project Scorecard can be derived from the Balanced Scorecard; therefore, the perspectives of the Project Scorecard are correlated to those ones, contained in the Balanced Scorecard. The Project Scorecard should be aligned with the organization's scorecard, comprising either four classic scorecard perspectives or additional unique perspectives specific for the project.

The traditional Project Scorecard perspectives are financial perspective, customer perspective, internal project processes perspective, and growth/innovation perspective (Figure 2) [2]. The objectives and the measures should be defined for each of the four perspectives of the project Scorecard. Moreover, the scorecard should include quantifiable measures that are connected to each stage of the project's life cycle [2].

The financial perspective reflects project's contribution to the overall strategy of the company in the monetary terms Potential measures that are associated with the financial perspective and the perspectives described below are shown in Figure 2 [3].

Customer perspective is referred to as one of the most crucial perspectives in managing the projects, regardless if the customers are external or internal [3]. This perspective takes into consideration such features as market value of the project outcome along with stakeholder satisfaction with the project deliverables [3].

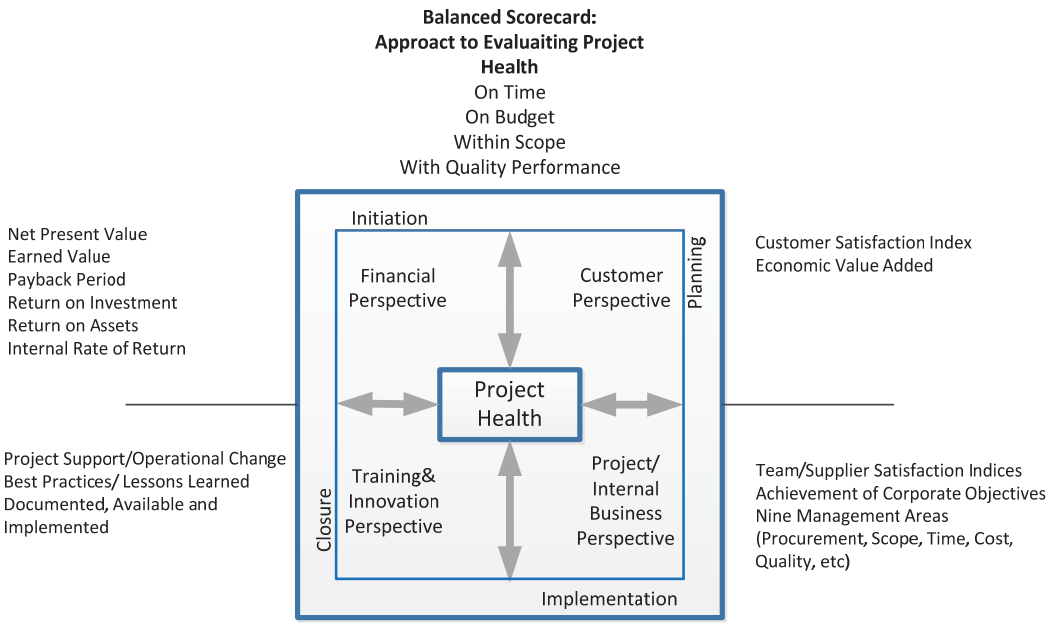

Figure 2: The Project Scorecard and the examples of the tools for the measurements [14]

The internal business processes perspective determines the project's contribution to the overall organization's competencies and estimates the degree, to which the project supports the mission of the organization and its strategic objectives [14]. The perspective contains objectives for the project management processes that are the most significant for the successful project execution. The processes include but are not limited to time management, quality management, risk management, resource management, etc [7].

It is of crucial importance for the organization to improve the performance continuously, in order to keep pace with the competition existing in the business environment [3, 14]. Therefore, the main objective of the growth/innovation perspective is to provide the required infrastructure for other perspectives. This perspective takes into account the long-range growth impact that the project has [3]. Additionally, the growth/innovation perspective focuses on the qualitative individual and organizational measures of growth and is closely aligned with the individual's development [2].

3. Project Scorecard for the modular platform strategy project

This study is intended to develop the Project Scorecard concept for the platform strategy project that is implemented in one of the suppliers to the healthcare industry. The company is one of the leaders in medical diagnostics. In the framework of the project, it is necessary to prepare the organization for the implementation of modular platforms. A platform is a planned core asset of at least one product family and incorporates features that are common in at least two family members. A platform contains standardized platform modules that provide aligned and standardized interfaces, which allow their combination. The products provided by the company should comprise single modules with standardized interfaces.

The Project Scorecard in this case serves as a tool for systematic and efficient project performance measurement. The perspectives included in the Project Scorecard should reflect distinctive features of the platform strategy project. Therefore, it is necessary to introduce four specific dimensions for the scorecard, as well as indicators that are required for the project performance measurement.

Due to the specific content of the project, classic Balanced Scorecard perspectives cannot be used in the initial way. They should be revised in order to be adapted appropriately to the project subject matter. The required perspectives should be chosen in line with the logic of the platform strategy project and a clear interrelationship among the different perspectives should be visible [10]. The four original scorecard perspectives used for the project are as follows:

- The **"Business and Strategy"** perspective reflects the impact of the platform's implementation and demonstrates project consequences from the financial perspective. It should also show the consequences of the chosen options and strategic decisions made in the framework of other Project Scorecard perspectives.
- The **"Project Results"** perspective describes the broad spectrum of project deliverables and demonstrates the influence of the modular platform's implementation on the organization. The customer aspect should also be taken into account in the framework of this dimension. The processes within the project and the development endeavors should be guided by this perspective.
- The key processes that are influenced by platform concept and that should be excelled at to maintain adding value are the main issue of the perspective **"Processes"**. This perspective also shows how the platform concept is transferred to the main processes and how the platform strategy is implemented.
- The **"Project Potential"** represents the development effort and the ability to conduct preliminary activities required for the platform strategy project realization. It is vital to identify the actions and establish the requirements that are crucial for the platform strategy project realization. This perspective comprises the measures that serve as the facilitators for the other three perspectives.

In addition to the four perspectives, the strategy map is used as a supporting tool and represents in a structured way the targets of different levels that should be achieved in the process of platform strategy project realization and illustrates the cause-and-effect connections between the dimensions. The strategy map serves as generic architecture by which means the platform strategy is represented. It describes the set of processes required to translate intangible assets into project and financial outcomes. In order to create a meaningful strategy map, it is essential to have an understanding of the hierarchical interdependencies between all the perspectives and the objectives within each perspective [6].

The strategy map for the platform strategy project is partially illustrated in Figure 3.

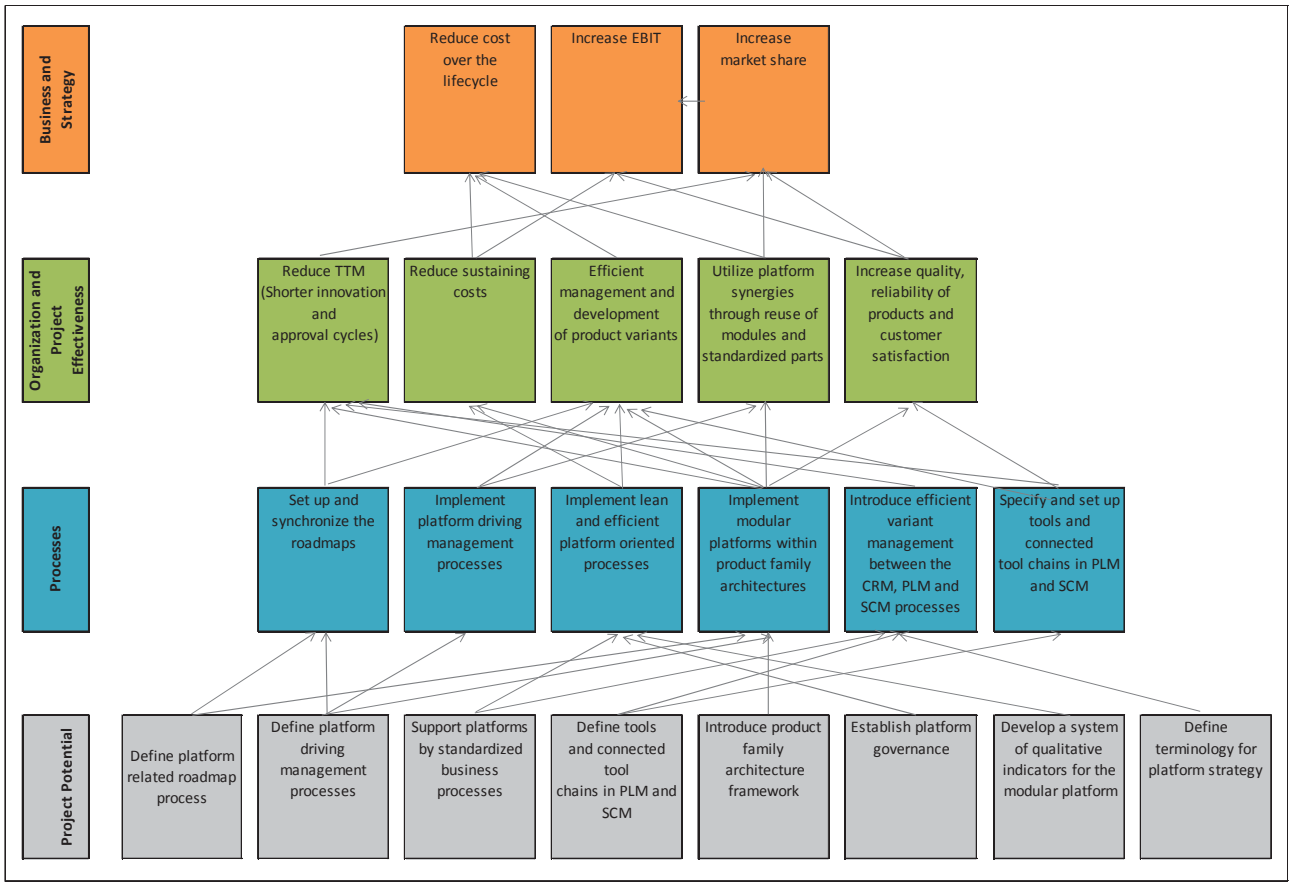

Figure 3 The Strategy Map [Created by the author]

The strategy map is presented in a simplified manner, and the complexity is reduced through the abstraction. It aligns the actions that employees perform on different levels of the organization with the

overall goals of the platform strategy, and it allows for testing and controlling the execution of strategy [9]. The strategy map, in this case, is a visualization tool that reflects the interrelations of various objectives within the platform strategy project. It demonstrates the goals hierarchy and the cause-and-effect relationships between the objectives going from the targets of the “Project Potential” perspective all the way through to the “Business and Strategy”. The goals are structured within the four levels (in line with the logic of Project Scorecard levels correlation) and are grouped and correlated to each of the perspectives of the individual scorecard.

4. Indicators

The objectives presented in the strategy map are assigned with the measures. The indicators are used to evaluate how critical functions and activities within the platform strategy project are performing in comparison with the business plan and the established platform strategy goals [8].

The indicators should have common definitions and precise meaning, and the entire team should agree upon them.They should be clearly specified and easily understood in the whole organization to prevent ambiguity and a variety of interpretations. The users of the scorecard should easily understand the operational and strategic importance of each measure as well as the intended direction in which the measure should be moved [9]. Complex definitions and complicated formulas should be avoided to make the process of calculation easier and to save efforts required for the calculation. Some examples of the indicators that can be used for the success of the strategy project evaluation are presented below.

EBIT margin is seen as a valuable indicator as it shows how profitable the activity is. It is a measure of the profitability on sales over a specific time period and gives information on the earnings ability. In order to use EBIT margin usefully, it is recommended to compare the results against other producers in the industry. The increase in EBIT margin reflects more efficient cost management or more profitable business.

Development costs are the costs that the company incurs from researching and developing a new product. Development costs include the absolute costs that are undertaken from the milestone D2 (budget for the development project is released) to the milestone R5 (the final release to the customer).

Sustaining costs within the company are characterized as the costs that have to be spent in order to keep the product on the market. Service costs per installed unit can be categorized as absolute service costs for the product variant divided by the number of the installed units. Service costs in this case consist of costs for spare parts, the service time, the time that technicians need to travel to the site, and the cost of maintenance.

Market share is a key indicator of market competitiveness. It is expressed as the percentage of the market that the company accounts for, is measured for the product groups, and compared to the competitors. Measurement, in this case, is done in respect to the sales volume (unit market share). Its increase will show that the market position of the company has improved in comparison to the competitors. This increase of market share has a direct impact on the revenue.

The number of installed units reflects the number of units of a particular type of a product that are actually in use worldwide and "locked in" with respect to spare parts, service contracts, upgrades, etc. The increase of the installed base leads to additional service contracts. In the case of high end units, these contracts are beneficial for the company. The number of installed units should be compared on a regular basis within a specific time frame (e.g. on a monthly basis). In addition to the number of installed units, it is possible to use the indicator Contract Coverage Ratio.

Cost for generating a new variant (or a material number) is an indicator that helps to measure the total costs that are generated by creating a new product variant or a material number and that are undertaken by the company. This type of cost addresses the whole life cycle costs.

Commonality index (CI) and Carry Over (CO) are the indicators used to assess the level by which platform synergies are utilized through reuse of the modules and the standard parts. The commonality index describes the monetary estimated level of reuse of the repeating parts in a product variant regarding the base variant. It can be calculated by means of dividing all material costs for the repeating parts in a

product variant by the sum of the material costs for the base variant. If the meaning of the commonality index increases, it implies that the components from the base variant are reused more frequently in the variants derived from the basis variant. Carry over defines the range of transferred standardized parts that were reused in a product variant and carried over from the previous models. If this extent is rising, then product standardization is intensified.

5. Major problems

The Project Scorecard implementation is a complicated endeavor that results in the increased costs in terms of time, employees' commitment and resources. The scorecard development demands the detailed description of the expected outcomes of the project together with the comprehensive goals definition. This process requires a high expenditure from the stakeholder's side, especially when the multiple stakeholders are involved in the process. The general agreement on the strategy, translating the strategy, the precise objectives definition, the selection of the measures and the targets consumes time and needs significant exertion.

Individually developed Project Scorecard considers all dimensions critical for the evaluation of the favorable outcomes or failures of the platform strategy implementation and, therefore, enables the comprehensive assessment of the project performance. At the same time, project performance is viewed from two opposite perspectives that are "The project has succeeded" or "The project has failed". The degree, to which the success has been achieved or how serious the failure was, is not reflected. Therefore, the project success is evaluated as either "black" or white" and the gradation is missed.

Besides, evaluation of the project's success is influenced by the personal opinion of the key participants involved in the project and their authority. The evaluation of the project's favorable outcomes or drawbacks is based on the comparison of the actual meanings of the indicators with the target meanings predefined at the outset. During this process the subjective assessment of the key project participants is involved. Therefore, the results of the assessment may be strongly correlated to the personal opinion of those, involved in the evaluation [4].

It is of crucial importance to update and adapt the scorecard depending on the emerging needs, in order to ensure constant improvement. The fundamental requirement for the Project Scorecard implementation is the frequent revision and the thorough analysis. Continuous assessment of the outcomes, obtained in the process of performance measurement, is vital and the corrective actions should be prepared and implemented, if necessary. Provided that the regular updates are missing, the scorecard will have the drawbacks and lose its original sense.

There is always a threat that the Project Scorecard can be overwhelmed with the indicators and the scorecard developers may create plenty of new measures and continue this process consistently. Despite the fact that there is no ideal amount of indicators, it is recommended to keep them up to 20-25 indicators.

6. Conclusion

Project management can get the same benefits from the Project Scorecard concept application to performance measurement of a project, as the organization in general which uses the Balanced Scorecard approach. By means of the performance measures, it is possible to track if the project is moving in the right direction and capture not only financial benefits that projects bring, but also intangible results of the projects. The Project Scorecard application in project management provides an opportunity to identify the intangible project drivers and track intangible project outcomes [1].

The range of the purposes of using the Project Scorecard is broad and comprises not only strategic, but also operational purposes. It assists in the platform strategy revision, promotes the communication within the project team members, and serves as a steering tool. By means of the Project Scorecard one can realize how different focus areas of the project are related to each other.

The Project Scorecard provides a framework for communicating the platform strategy by means of indicating the objectives, measures, and goals. It is a useful tool that represents the abstract platform strategy in the definite terms that can be communicated within the organization. Breaking the strategy

into measures and goals enables the proper contribution to the platform strategy and makes sure that the strategy is followed at all levels of the organization.

7. References

[1] Basu, R.; Little, C.; Millard, C., 2009: Case study: a fresh approach of the Balanced Scorecard in the Heathrow Terminal 5 project. *Measuring Business Excellence, vol. 13, no. 4.*

[2] Devine, K.; Kloppenborg T. J.; O'Clock P., 2010: Project measurement and success: a Balanced Scorecard approach. *Journal of Healthcare Finance, vol.* 36, no 4.

[3] Eilat, H.; Golany, B.; Shtub, A., 2008: R&D project evaluation: an integrated DEA and Balanced Scorecard approach. *Omega. The International Journal of Management Science, vol.36.*

[4] Greif S.; Runde B.; Seeberg I., 2004: Erfolge und Misserfolge beim Change Management. Goettingen: Hogrefe Verlag.

[5] Kaplan, R. S., Norton, D. P., 1993: Putting the Balanced Scorecard to work. In: *Harvard Business Review; September-October 1993.*

[6] Kaplan, R. S., Norton, D. P., 2001: *The strategy-focused organization. How Balanced Scorecard companies thrive in the new business environment*. Boston, Massachusetts: Harvard Business Press.

[7] Maurer, T., 2013: Project Management Scorecard: Einsatz und Wirkungsweise der Projektmanagement Scorecard zur Erfolgmessung in Strategischen Projekten, Retrieved from http://www.mmsolution.at/pm3consulting/home/publications_dt_files/Strategisches%20Projektmanagement%20-%20PM%20Scorecard.pdf, last accessed August 12, 2014.

[8] Mobley, R. K., 2013: Tweak KPIs to improve performance. *Plant Engineering. vol. 67, no. 6.*

[9] Niven, P. R., 2002: Balanced Scorecard step-by-step. Maximizing performance and maintaining results. New York: John Wiley & Sons.

[10] Olve, N. G.; Roy, J.; Wetter, M., 2000: Performance drivers. A practical guide to using the Balanced Scorecard. New York: John Willey &Sons.

[11] Phillips, J. J.; Bothell, T. W.; Snead, G. L., 2011: *Project management scorecard: measuring the success of project management solutions.* Florence, KY: Taylor and Francis.

[12] Selders, Markus: Project Scorecard. Transparenz für Strategische Projekte. Retrieved from http://www.controllingportal.de/upload/old/pdf/fachartikel/Instrumente/project_scorecard_white_paper.pdf, last accessed August 12, 2014.

[13] Shenhar, A. J., Dvir, D., 2007: Reinventing project management: The diamond approach to successful growth and innovation. Boston, Massachusetts: Harvard Business Press.

[14] Stewart, W. E.,2001: Balanced Scorecard for projects. *Project Management Journal, vol. 32, no. 1.*

Negotiations in Projects – key to success

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1 Introduction

Since the very beginnings of humankind, negotiations were the key to individual or collective development. Bargaining is our daily life – what movie will we watch on TV today in our family? What pay rise will I get? How to get what I want at the project meeting?

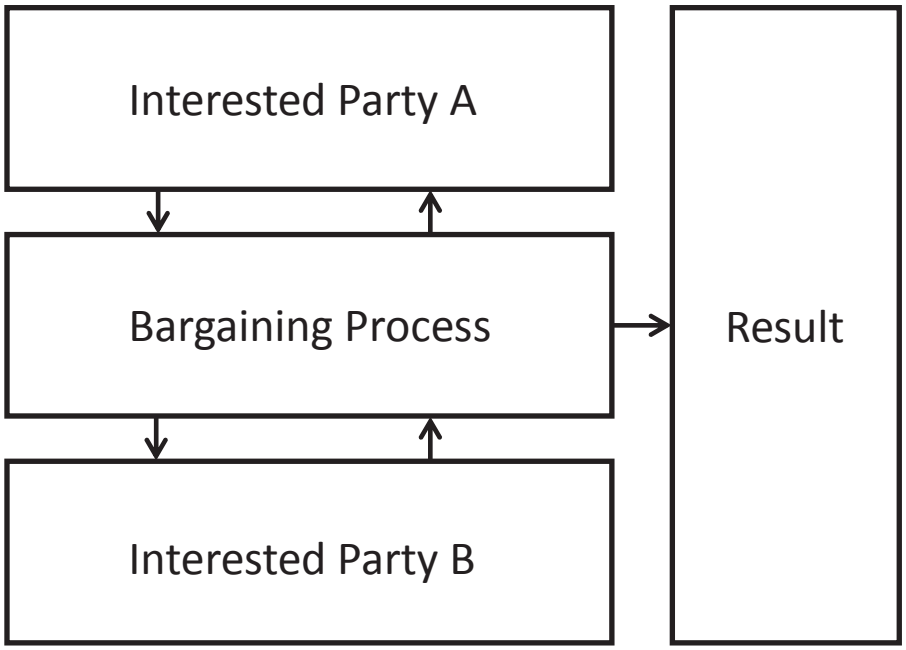
In our daily working life the quantitative ratio of the need to apply negotiation tactics is proportional to our level in the hierarchy. Negotiations are to be understood here as conciliatory techniques shaping interactions that are conducted by autonomously acting players of the system. As the creative component of work becomes more important as we climb the company hierarchy and "unfriendly" techniques like biting and killing are passé, the need for negotiating increases. A good negotiation means good effectiveness, problem solving, benefit, success ….

The author presents in chapter 3) "The toolbox of negotiation" seven negotiation methods that promise success in bargaining – all based on his own professional experience. Each of the techniques is illustrated with a brief example. Before this an overview about general known negotiation techniques is given in Chapter two. The general theoretical overview in combination with the applied methods in real business gives a good possibility to reach targets in negotiations. Keeping in mind, that Project Management is always new and unique the importance of negotiations is visible. In contrast to repetitive processes and long term business with frame contracts and organized ways bargaining is much more important in Projects. There we have to negotiate from the very beginning (convincing sponsors, getting partners…) throughout the project (day by day creating the operational schedule, having project participants on board, purchasing components…) till the ending (closing the project with the client, agreeing maintenance contracts for the operation phase after implementing…).

2 Overview of the theory of negotiations

2.1 Structure and Team

The general situation of a negotiation in a catchy overview is given in this graph (Barisch, 2011, p. 12):



Graph 1 - Components of Negotiations

At first it is visible that science can care about the team of negotiation (in both parties A and B), the result and the process. The author concentrates in chapter 3) on the **process** and techniques of dealing within the meetings.

The graph shows that the **result** is the outcome of negotiation and it is obvious that the result, the target, the outcome is most important and initiation of the negotiation. The target of a negotiation is various. It is defined by a) our own goals b) the need of help/agreement from other parties and c) the opposing interest of the other party. Negotiation means from this point of view to reach the own targets by offering target achievement for the other party as well. In general the targets can be differentiated in (Martinez, 2010, p. 53):

a) distributive bargaining (who gets the biggest share of a limited resource)

b) integrative bargaining (negotiations about rights and responsibilities),

c) attitudinal structuring (influencing the personal relation between parties)

d) intra-organisational bargaining (defining internal roles in organisations). Some possible "results" from point of view of Project Management were mentioned already in the introduction (getting partners on board, purchasing components, closing the project with the client, fights about responsibilities in a project).

In her elaboration Barisch cares mainly about the build-up of the parties: the composition of the negotiation **teams**. She creates three areas of team assembling (Barisch, 2011, p. 47): a) sociodemographic (age, gender, religion, level of income, level of education…), b) psychographic (values, aggressiveness, knowledge, experience, empathy…) and c) organisational (hierarchy, role, seniority in the team…).

2.2 Ten most Promising Negotiation Rules

In industrial/business negotiation context Wannenwetsch offers (Wannenwetsch, 2013) 10 rules to have successful negotiations with suppliers, clients or subcontractors. They tend to be more behavioral hints than concrete ways out of a stucked negotiation. In detail the ten hints are (Wannenwetsch, 2013, p. 43 ff):

a) prepare yourself in a written form
b) train the negotiation upfront and be positive
c) respect your counterpart and listen to body language
d) discuss the expectations of your counterpart and the agenda upfront
e) listen and ask
f) no tricks - no blaming
g) connect your wishes with your offers
h) use tools like summarizing, making a break, listing arguments
i) even if the negotiation fails be positive – next negotiation might come
j) lessons learned, write down next steps, what you achieved, "to do's"

But how can you find real solutions if your interest differs too much from the interest of the other side? This will be discussed in chapter 3).

2.3 Harvard Concept of Negotiation

The best know concept of bargaining was developed by Fischer/Ury/Patton (Fischer, Ury, & Patton, 1991) and is copyrighted and known as “Harvard Concept”. It is based on four general declarations

a) Deal with involved people and topics in a different manor – concentrate on the topic and don’t fight against concrete people during a negotiation.
b) Focus on the interests of all participants – so try to understand the positions of the participants by understanding the interests behind to find better solutions than just looking at the surface of the announced positions.
c) Develop various alternatives of a solution
d) Try to find objective and neutral criteria to evaluate and find solutions like independent authorities, surveys, expert evidence etc. to reach targets for both parties. (Wannenwetsch, 2013, p. 33 ff)

These 4 rules give a general frame but they are still abstract and if the situation in a negotiation is critical and although you concentrate on interests and do not fight against people you might not find solutions because the distance between two positions is too far from each other or competitors are closer to your negotiation partner.

3 The toolbox of negotiation

The author – almost one decade board member in different boards in different countries - was asked by one protégé how he managed to be successful in negotiations. The following 7 points were the answer and were handed over to the protégé.

Get ready intensively

Those who prepare well, have clearly defined goals of specific negotiations, can plan possible negotiation outcomes up front and plan a negotiating roadmap. As negotiations typically take place spontaneously and with short lead time, preparation may provide strategic advantage. (Example: begin negotiations on pay rise only after reviewing the market offerings in your

industry/country which can be used in favour of your negotiation, prepare on a slide an overview of the chosen wage agreement helping you).

Introduce new elements

Often the negotiations revolve around a specific standpoint. Frequently it turns out useful to have the negotiations around many items, as in case of talks concerning only one subject there is no potential for compromise. This quickly leads to (two) fronts growing stronger that are difficult to overcome without significant concessions by one side. But when we introduce a totally new element, opportunities for finding a compromise increase and so does the chance of reaching an understanding. (Example: a hotel owner wants to buy land from the company, but the parties fail to agree on the price. Agreement becomes possible only after the company organises its next company meeting at the hotel of the negotiating partner, example two: negotiations about the price list of a supplier fail – only if you offer a long term contract you might win)

Use emotional examples

In different negotiating situations it is helpful to find simplified examples of conflicts that – if cleverly selected – may yield results through creation of “positive emotions”. (Example: during fundraising for a common cause one company wants to pay only 50% of what other companies bring to the table. Positive emotions may be invoked by comparing victims/beneficiaries to everyone’s children who require same help from everyone – then agreement is reached quickly, as who would not help his own children? Example two: someone wants to buy a plot and now sits at the table of negotiation with the seller and only criticizes the plot and explains all negative sides; the seller stopped the accusation and said “imagine you want to marry me – and now you are here for wedding bargaining and only criticizing me – please express your offers for me”, 10 minutes later the agreement was found)

Find innovative solutions

Often negotiations fail to lead to agreement because problem solutions are not constructed flexibly enough, too little empathy is demonstrated for real needs of the other party or simply the “innovation factor” in the talks is undervalued.
During preparations do think about individual, intelligent or extraordinary solutions. (Example: two brothers from the neighbourhood are quarrelling for weeks about division of inheritance after their mother. To the relief of both parties the following solution was adopted: both brothers will prepare a list of all inherited items. One of the brothers will independently from the other divide the inherited items into two piles of total value as equal as possible. The second brother will then be offered a choice between the two piles. The decision which brother will make the division and which will make the selection will be made with a flip of a coin.)

Find items of different relative value

Negotiations most often concern different services / products, but in the end almost always boil down to the remuneration. Compromises can be reached particularly well in case of services / products having different value for each of the sides. If such items can be identified or generated at the very beginning (see example “Introduce new elements”: variable costs for the hotel owner are much lower than a normal bill for such a company event at the hotel) it will be easier to overcome different perceptions of price. (Example: a retired craftsman wants to sell his flat without renovation. The buyer agrees in principle, but calculates additional 10% costs for renovation in his budget and then rejects the purchase because his budget is not high enough. The seller suggests that the buyer selects and buys the materials himself, while the redecoration work will be performed by the seller in his spare time).

Group problems and solve them together with the partner

Typically negotiations require discussing many items. In more complex situations, like turnkey delivery of headquarters building or in case of long term framework agreements there may be even 50 or a 100 of individual items. Negotiating each in turn may lead to conflicts that seem hard to resolve. If such unresolved items are noted down and left till the end, when other problems already have been positively dealt with, it is easier to focus on solving them.

There may be an opportunity to offset them by mutually accepting seemingly irresolvable conflict points. With well conducted negotiations it is possible to write down side-by-side list of same number or same weight items.
(Example: during the first negotiations on collective work agreement of 90 items only 2 are left open at the end. The employer does not agree to extension of holidays by one day, and the employee representatives oppose to extension of workdays by 15 minutes. Finally the parties settle on additional 15 minutes of daily work time and additional 3 days of leave.)

Never terminate the negotiations

If the parties have already sat at the negotiating table it can be assumed that both parties are willing to enter into transaction. This initial "declaration of will" must not be underestimated even if no consensus will be reached. At the end of unsuccessful talks it is always necessary to formulate what step it will take to reach the agreement. This may be division of tasks, inclusion of mediators, postponing the talks or changing venue (e.g. to a restaurant), agreeing on meetings in a smaller group or setting up a working group. Also time may be requested for review and thus a new meeting set up. This gives room for new ideas, testing out new information or perhaps the approach of both parties will change. (Example: negotiations on salaries with trade unions ended in impasse despite meeting, negative feelings resulted in suspension of talks. However, proposal was formulated for meeting without specified agenda, at a dinner hosted by the employer. After dinner, with wine served, face to face talks resulted in a breakthrough. Example two: trade unions and employer were not able to find a solution but agreed to sit together – even for nights and days without sleep – till a solution is on the table)

- Some General Recommendations for Negotiations -

Besides the techniques specified here, also other factors are important and possible to plan for negotiations, such as the venue (own offices with the benefit of being on one's own turf), language (never be at a language disadvantage), opening of negotiations (easygoing? formal? intimidating?), conscious use of time pressure or inclusion of personal experience and private anecdotes.

When the goal of the meeting is reached, the principle of "what has been said, may be written down" shall apply. In case of legally independent entities writing the agreement down is a

standard, but also in case of in-company talks it is worth drawing up minutes of talks to avoid potential future conflicts. Also in case of formal contracts it makes sense to summarise in several points the "spirit of the agreement" right after completing the negotiations, so that disputes over details that cannot be avoided in practice, would be limited to a minimum with proper provisions and additional clauses.

4 Summary

Whether in specific situation the negotiations will be crowned with success or not – the ability to communicate and negotiate is a particular distinction of humans as social and political beings who create communities and develop. By no means should the negotiations and looking for compromises be perceived as its weakness, but as its strength and ability to achieve goals and develop areas of responsibility.

References

Alfredson, T., & Cungu, A. (2008). *Negotiation Theory and Practice.* Rome: FAO.

Barisch, S. (2011). *Optimierung von Verhandlungsteams.* Wiesbaden: Gabler.

Fischer, R., Ury, W., & Patton, B. (1991). *Getting to Yes: Negotiating Agreement Without Giving In.* New York: Penguin Books.

Krick, E. (2013). *Verhandlungen im Konsensverfahren.* Darmstadt: Springer.

Martinez, A. R. (2010). *Micro-Bargaining as Enhancer of Knowledge Management.* Mering: Hampp.

Powell, M. (2012). *International Negotiations.* Cambridge: Cambridge University press.

Project Management Institute. (2008). *PMBOK- A Guide to the Project Management Body of Knowledge.* Pennsylvania.

Tracy, B. (2013). *Negotiation.* New York: AMACOM.

Wannenwetsch, H. (2013). *Erfolgreiche Verhandlungsführung in Einkauf und Logistik.* Berlin: Springer.

Wöhe, G. (2008). *Einführung in die Allgemeine Betriebswirtschaftslehre.* München: Vahlen.

Applying Project Management Methods in Creating a Start-up Business Plan: Case of *Blendlee*

Jolita Kiznyte, Marcos Welker, André Dechange

Abstract

The importance of entrepreneurial ventures in economic development is undeniable. Recent years trend shows that the increasing number of small, innovation driven Start-up companies that operate through Internet platforms is shaping the future of business. It seems that everyone nowadays can become an entrepreneur, nevertheless, nine from ten Start-ups fail. Scientists are trying to find solutions on how to increase the success of early stage Start-ups. One of the main suggested methods is to devote a lot of effort for the business planning. But in order to create a 'winning' business plan, entrepreneurs need to have or develop management skills and use the most effective methods. Project Management is acknowledged as a discipline that highly increases the efficiency of the implementation of projects. Therefore, if the creation of a Business is seen as a project, that discipline can be used to increase success rates of this kind of project, with beneficial methods in areas of planning, budget, risks control, time management and the creation of a teamwork culture in the organization. To manage a dynamic Start-up creation process Project Management can be used to create a management system for the whole business (starting from the Business Plan creation). The aim of the article is to research the possibilities of using Project Management Methods in the creation of Start-up Business Plans. The empirical research was designed by combining the literature study and the single case study of applying Project Management Methods in creating Blendlee Start-up business plan.

Keywords: *Start-up, Project Management, Business Plan, Entrepreneurship*

Introduction

Recent years trend shows that the increasing number of small, innovation driven Start-up companies that operate through Internet platforms is shaping the future of business. Favorable conditions for creating a Start-up company suggest that nowadays everyone can become an entrepreneur nevertheless, nine from ten Start-ups fail. Scientists discuss on the main reasons of failure - the main reason (around 42% of cases of failure) is that there is no market demand for the created products or services (CB Insights, 2014: 2). Other failure cases are mostly caused by lack of solid business management skills as even ventures that have great business ideas fail facing first challenges on the way. Scientist are trying to find solutions on how to increase the success of early stage Start-ups. One of the main suggested methods is to devote a lot of effort for the business planning. A highly beneficial tool to implement this process is a well-prepared Business Plan that defines the whole business idea, managerial approach and business strategy in one document. But in order to create a 'winning' business plan, entrepreneurs need to have or develop management skills and use the most effective methods.

Project Management is acknowledged as a discipline that highly increases the efficiency of the implementation of projects. Therefore, if the creation of a business is seen as a project, that discipline can be used to increase success rates of this kind of project, with beneficial methods in areas of planning, budget, risks control, time management and the creation of a teamwork culture in the organization (Nixon, 2015). Therefore, the author raises the main **question**

of the research: *What combination of Project Management Methods could increase the success rate of Star-ups' Business Plans?*

Aim of the research: To research the possibilities of using Project Management Methods in the creation of Start-up Business Plans. The author defined the objectives that address the aim of the research:

1. Identify the key success factors in Start-up business creation.
2. Analyze Project Management Methods that can be used for Start-up Business Plan creation.
3. Define the combination of Project Management Methods for *Blendlee's* successful Business Plan creation.

Methodology: The empirical research design is combined from a literature study and single case study.

Scope: In the case analyzed, the creation of the business was divided into four project cycles. The scope of this master thesis was limited to an analysis of the first cycle in the creation of a Start-up, here the development of a 'Business Plan'.

The Case: For the empirical research, the case of *Blendlee* was chosen as a successful case, because its Business Concept and Business Plan won the first place in open international competition: the *Ericsson Innovation Awards 2015*. The task of the competition was to create an innovative solution to solve a problem which would be sustainable and applicable to the global community. This year's topic was: "Innovation for the future of learning", and there were in total 370 projects submitted. *Blendlee'*s victory in the competition confirms that the approach of combining Project Management Methods in creating Business Plan of the Start-up was successful and the case can be used as an example of a good practice.

Key success factors in Start-up venture creation

"The world of startups today offers a preview of how large swathes of the economy will be organized tomorrow. The prevailing model will be platforms with small, innovative firms operating on top of them. This pattern is already emerging in such sectors as banking, telecommunications, electricity and even government (The Economist, 2014: 2)". Graham (2012) defines: "A start-up is a company that from its roots is designed for a fast growth (quick scaling). All other characteristics of a start-up is followed by tendency to grow, for example, it can be newly founded venture". He adds that the main focus of the growth is that it is unconstrained by geography – this is the main differential between start-up and small business, so mostly start-up is associated with technological business ventures. Neil Blumenthal, co-founder and co-CEO of *Warby Parker* defines: "A start-up is a company working to solve a problem where the solution is not obvious and success is not guaranteed." Graham (2012) agrees on this approach and notes that an entrepreneur who starts a start-up is committing to solve a more challenging type of problem than ordinary businesses do. He adds: "As entrepreneur you're committing to search for one of the rare ideas that generate rapid growth."

The concept of start-up is closely interconnected to entrepreneurship and entrepreneurs. Schumpeter (1942: 81-

86) defines entrepreneurship: “It is carrying out of new combinations of firm organization — new products, new services, new sources of raw material, new methods of production, new markets, new forms of organization”. Dollinger (2008: 4) defines: “In the new millennium, the ideas, talents, skills, and knowledge that promote entrepreneurship are evident in people all around the globe, but especially in today’s generation. This new direction is a change from previous times when the forces for economic growth tended to favor more established business persons from the corporate world. But the face of the world economy has shifted, and young people today are well suited for entrepreneurial activity”. Economic and social shifts have provided added momentum for start-ups. According to a recent survey of 12,000 people aged between 18 and 30 in 27 countries, more than two-thirds see opportunities in becoming an entrepreneur (The Economist, 2014: 2). Dollinger (2008: 4) summarizes that entrepreneurs of 21st century are technologically precocious, are immersed in technology and have internalized its power. The main reason why they are so successful and not afraid to risk creating new business ventures is that this generation is passionate, inquisitive, and challenging, entrepreneurs welcome change and embrace the idea of progress, have portable skills. The approach of scientists suggests that entrepreneur suppose to have certain profile of personal traits, characteristics, skills, knowledge, experience in order to succeed in creating a new venture. Nevertheless, there are many challenges along the way and often entrepreneurs do not have the skill-set needed to create and run the business and the rate of failure increases.

Assessment of entrepreneurial and management skills and teams’ skills composition is the first thing to consider before initiating the business: Passion for starting a company is important, but entrepreneurs also should have skills and experience in key business areas such as cash flow management, marketing, financing, inventory control, and others (Scarborough, 2012: 14). Titus (2004: 4) analyzing the reasons why business fail, states: “Ninety percent of business failures are associated with “management inadequacy”, which consist of either management inexperience or incompetence consist of either management inexperience or incompetence”. He defines that only person with developed management skills is able to implement and monitor the strategic and operational plan of the start-up. Efficiency of strategic plan is strongly dependent on management’s ability to implement changes needed in day-to-day operations. Many factors need to come together to start and grow a successful new venture. However, first comes a great idea and directly after that the people who can realize it. It is generally believed that start-ups thrive and prosper when standing on the shoulders of more than one person – especially science-based and high-tech start-ups (Timmons, 1994: 89), start-up is in a risk of failing if majority team members have a very similar point of view on things and cannot develop critical thinking, low motivation and dedication, also insufficient or outdated skills in the area affect the success of the venture. This Start-up failure reason is highly interconnected with the lack of certain skills in the team, for example, balanced teams with one technical founder and one business founder raise 30% more money, have 2.9X more user growth and are 19% less likely to scale prematurely than technical or business-heavy founding teams (Marmer at al., 2012: 5). Composing a venture team, according to Seifert et al. (2008, p. 90), is one of the most important success factors in new business ventures creation. Scientists point out that team members have to complement and balance each other, also a very important aspect is how people effectively operate as a team. Key

points to consider is ability to establish trusting working relations with clearly defined roles and responsibilities, effectiveness of communication processes, culture of the team (even the working atmosphere) and ability to share constructive criticism. Overall, comparing to homogeneous teams, diverse teams are recognized as more effective in accomplishing versatile tasks. The importance of a complementary teams' composition nowadays is more relevant: "In the past, startups almost universally began with an idea for a new product. Now the business usually begins with a team, often two people with complementary skills who probably know each other well (The Economist, 2014: 3)."

Business feasibility analysis and assessment of the concept is essential: A feasibility analysis is the process of determining whether an entrepreneur's idea is a viable foundation for creating a successful business. Its purpose is to determine whether a business idea is worth pursuing. If the idea passes the feasibility analysis, the entrepreneur's next step is to build a solid business plan for capitalizing on the idea (Scarborough, 2012: 159). Feasibility of a new venture and assessment of the market potential is often neglected pre-business planning activity. Even if the business concept is in the early stage critical evaluation allows find, address and eliminate flaws before writing business plan. It requires focus, analytic skills and critical point of view. Faley (2005) states that first step of feasibility analysis is to conduct a secondary market research (assessment of the market using literature, statistical databases, publications, etc.). After secondary market research entrepreneur has to talk with different stakeholders (from future team member to potential customer/user) that will help to conduct primary market research to define their perception about the concept and their needs. Phase II also includes early-stage analysis of the venture, creation of a path from business concept towards the point when the venture will become an operating business, define the value which company could offer for potential investors and what type (and amount) of investment founder needs.

Business Plan – a beneficial tool for Start-up business creation process: Without a business model and business plan a company exists without a clear vision and direction what increases a risk of failure when startup faces its first challenge. Some entrepreneurs start their business without having a clear business concept with defined target customers and without fully investigating the industry. If entrepreneur doesn't do a market research he has no perception on the trends in the industry, opportunities and threats, positioning of the business, target customers needs and expectations so there is no chance that he can prepare a realistic business model and plan (Pendrith, 2014). Creating a comprehensive business plan allows entrepreneurs to determine whether a business idea is likely to succeed and to identify the steps they must take to create a successful company (Scarborough, 2012: 14). A good business plan helps identify the mission; cost structure; market; external influences; and strengths and weakness of a business. The business plan can separately include a marketing plan, operating plan, etc. (Titus, 2007: 4). Scarborough (2012: 14) defines that sometimes the under-funded venture problem occurs from the very beginning as entrepreneurs are starting a business with too little capital is a sure recipe for failure. Experts suggest that entrepreneurs have the cash equivalent of 6 months of expenses available. Pendrith (2014) explains that if start-up gets under-funded it is a result of poor planning because a properly developed business plan tells exactly how much money is required for start-up expenditures and to operate the business until cash flow is positive.

A business plan is a planning tool for transforming an idea into reality. It builds on the foundation of the feasibility study but provides a more comprehensive analysis than a feasibility study. It functions primarily as a planning tool, taking an idea that has passed the feasibility analysis and describing how to turn it into a successful business. Its primary goals are to guide entrepreneurs as they launch and operate their businesses and to help them acquire the financing needed to launch (Scarborough, 2012: 160). There are two primary objectives to preparing a business plan. The first is external, to obtain funding that is essential for the development and growth of the business. The second is internal, which is to provide a plan for early strategic and corporate development. This helps guide an organization towards meeting its objectives, by keeping the business entrepreneur and all its decision-makers headed in a predetermined direction, and by setting out how the company will be run for the next two to three years. (IFAC, 2006: 4). Gumpert (1997: 120 – 147) outlines more reasons why business plan is an essential tool for start-up success. He defines that business plans helps to plan the future of new venture which includes raising entrepreneurs self-awareness of owning business, serves as prerequisite for convincing potential investors to finance the new venture, motivates team members and helps them to connect with the vision and goals of the business, might help prosperous employees decide whether they want to join the team or not, detailed business plan raises a credibility in making contracts and arranging strategic alliances, in the case of mergers and acquisitions business plan serves as a company résumé, helping demonstrate that the value of the business is the highest possible. 2007 study by Babson College found that start-ups with a well-written business plan raised twice as much capital in first 12 months (Lundlam, 2015). Researcher reviewed 20 random business plans that were submitted to venture capitalists and found main pitfalls of business plan (Dollinger, 2008; 180): Founders were failing in defining a specific business strategy (30%), discussing technical idea protection (55%), identifying the details of the competition (75%), providing adequate details of the financial projections (80%). Also, the teams lacked marketing experience, and the marketing sections of the plan were weakly developed (40%), 10% of business plans had no financial projections at all and 15% omitted balance sheets. This shows that entrepreneurs have to use certain management techniques not only to successfully run the business but deliver such deliverables as business plan.

Project Management Methodologies for Start-up creation

Project management in the modern sense began in the early 1950s, driven by businesses that realized the benefits of organizing work around projects, and the critical need to communicate and co-ordinate work across departments and professions (Haughey, 2014:1). Over the years the discipline evolved, suggesting many different methodologies to choose from in order to find the best solution for the organization. To manage a dynamic Start-up creation process Project Management can be used to create a management system for the whole business (Starting from the Business Plan creation), but the topic is relatively new and there is no previous research done. Experts on project management and business practitioners agree that several Project Management methodologies are already being used in Start-up business, especially for software development projects, but they are mostly focused on the software development and not on project and business management processes. But there is another possibility to benefit from this discipline in Start-up creation – to combine different methodologies in order to find the best methods

that fit specific issues of different type of Start-up that can be not only software development.

Mulcahy (2009: 29) notes that in order to complete a project there is a need to choose two main methodologies: the first is a project life cycle with actions what project manager need to do to complete the work and the second is project management methodology or project management process for defining how to manage the project. There are many different project cycles, depending on the industry were projects are being implemented. As the scope of this research is only an initial phase of the start-up (the first cycle - Business Plan creation) the analysis of Project Management methodologies carried out below is limited to methods and principles that could be used in this phase. These all methodologies definitely have many more methods and tools that can be used (and are not analyzed in this paper) in later Start-up phases as for example Agile and Lean in software development cycle.

Project Life Cycle approach: According to PMI (2013: 38) project life cycle (Figure 1) is the series of phases that a project passes through from its initiation to its closure. The phases are generally sequential and can be broken down by functional or partial objectives, intermediate results or deliverables, specific milestones within the overall scope of work, or financial availability. Phases are generally time bounded, with a start and ending or control point. A life cycle can be documented within a methodology. The project life cycle can be determined or shaped by the unique aspects of the organization, industry, or technology employed. While every project has a definite start and a definite end, the specific deliverables and activities that take place in between will vary widely with the project. The project life cycle approach provides the basic framework for managing the project, regardless of the specific work involved. Even the projects vary in size and complexity they can be mapped by following generic life cycle structure (Figure 1): *Starting the project, Organizing and preparing, Carrying out the project work, and Closing the project.*

This generic life cycle structure is often referred to when communicating with upper management or other entities

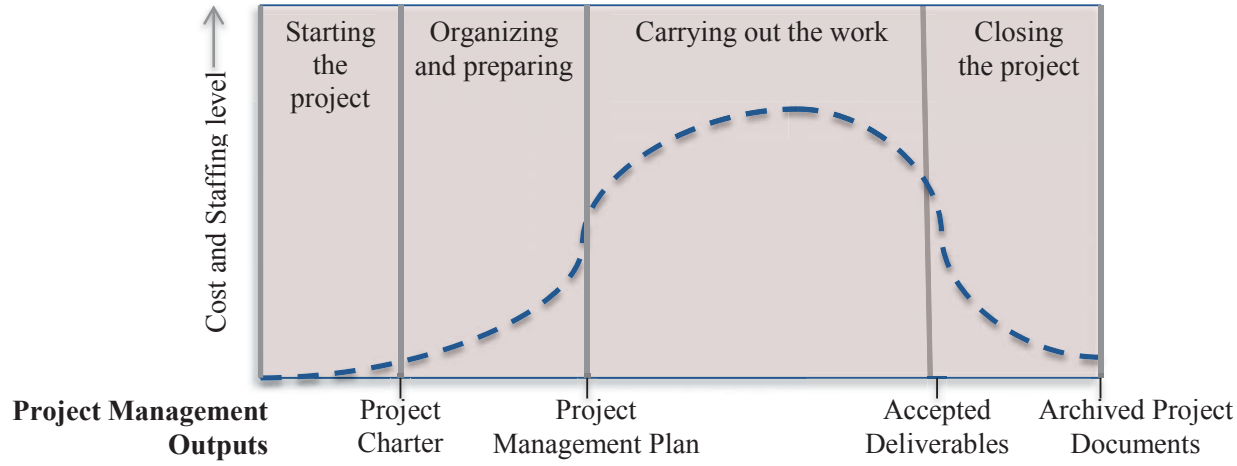


Figure 1. Typical cost and staffing levels across a generic project life cycle structure (PMI, 2013)

less familiar with the details of the project. It should not be confused with the Project Management Process Groups, because the processes in a Process Group consist of activities that may be performed and recur within each phase of a project as well as for the project as a whole. Mostly generic project life cycle is used in various projects but for more

specific projects, for example IT infrastructure or software development, there may be other types of project cycles applied. As predictive life cycles: Waterfall - linear ordering of the phases, which can be strictly sequential or overlapping to some extent; Prototyping - functional requirements and physical design specifications are generated simultaneously; Rapid Application Development (RAD): based on an evolving prototype that is not thrown away, etc. Or adaptive life cycles: Adaptive Software Development/ASD - Mission driven, component based, iterative cycles, time boxed cycles, risk-driven, and change-tolerant; Spiral - Repetition of the same set of life-cycle phases such as plan, develop, build, and evaluate until development is complete; Agile and SCRUM - Similar to above adaptive life cycle models with iterations called 'sprints' that typically last one week to 30 days with defined functionality to be achieved in each sprint; active management role throughout (Archibald, 2012; 5-6). Scientists agree that well defined project life cycle enables to apply systematic mindset to create, plan, schedule, manage the project through all phases and, what is more, to evaluate the success and the value of the whole project and its results (the outcome). Without clear view of the project life cycle it is challenging to reach the full potential of systematic and structured project management. In the case of Start-up the whole business creation process can be divided in different cycles with intermediate deliverables (milestones). It depends on the specifics of the venture what length the cycles should be because it is dependent from resources and knowledge the founders have.

Project Management Process Groups by the Guide to the Project Management Body of Knowledge (PMBoK): this guide is well-known and widely-used in the project managers community as a standard the guide provides and defines established norms, methods, processes, practices, skills, tools, techniques that can have a significant impact on increasing the rate of projects success. Also, it includes a common vocabulary for project managers to use in project management concepts and practice that is recognized as an essential element of a discipline as universal language for professionals. The purpose of Guide to the Project Management Body of Knowledge (PMI, 2013; 1): "Fifth Edition provides guidelines for managing individual projects and defines project management related concepts. It also describes the project management life cycle and its related processes, as well as the project life cycle."

The standard is based on application and integration of the 47 logically grouped project management processes that are categorized in five process groups (Figure 2):

- ***Initiating:*** definition of a new project or a new phase of project that exists with authorized permission to start it (project or phase).
- ***Planning:*** establishment of the scope of the project, definition of objectives and set of actions in order to achieve these objectives.
- ***Executing:*** performing the tasks that are defined in the project management plan, the performance has to meet the project specifications.
- ***Monitoring and Controlling:*** tracking, review, regulation of the processes and the performance of the project, identification of areas where the changes are needed.
- ***Closing:*** formal finalization of all activities throughout all process groups.

Mulcahy (2009: 30) explains the connection and transaction between project process groups. She defines that initiating has to be approved using some high-level planning in order to make a project selection if it is feasible (Figure 2).

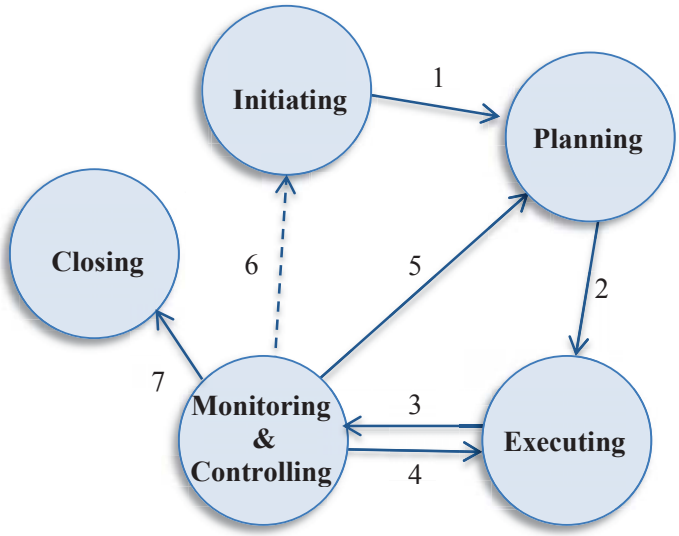


Figure 2. Connection between project management process groups (Mulcahy, 2009: 30)

Once the project is approved the process moves to a detailed planning process group (1) where the plan for how the planning will be done, how the project will be monitored and controlled. Then project moves to execution (2) where the work is being done according to the plan taking into account all processes and procedures what were detailed in the project management plan. Along the execution the work results are being monitored and controlled (3) to make it sure that the project follows the plan (baselines). If there are any variations that require changes the changes are being approved and the actions moves to execution to implement changes (4) in order to fix the variances. When the changes are approved the revision of the management plan is needed in order to identify the impact on the baselines (5). After rearranged management plan the actions continue in executing according new plan and also they are monitored and controlled to the revised baselines (3). In the case of being far away from the baselines sometimes the project requires analysis whether is reasonable to continue the project so it moves back to initiating (6) to make the decision. When the project work is done or it faces the deadline (terminated project) it moves to the closing process group (7). For small projects there's usually only one set of project management process groups for the whole project that can be repeated throughout the project cycle. Complex and large projects often require the distinction of different phases and each of the project phase has it's own project management process groups.

Defining the value of PMBoK in Start-up business creation it is important to compare the business creation to a project, even though the Guide is very comprehensive and suggests many methods how to manage project from small to very complex projects it can be applicable to small business ventures as well. Concerning Knowledge Areas they all can be addressed during Start-up venture creation as they cover wide range of areas, for example planning, stakeholder, communication management and many more. If founders do not have a lot of management experience –

this guide can help to build the whole management culture in the organization, because it provides step-by-step actions in order to create a management system, starting from initiation to closing process groups. As Start-up environment is very dynamic and changing very often founders can chose what amount of methods, tools and techniques from the methodology they would like to incorporate in their Start-up management.

Lean approach for Start-up management: Lean approach was originated in the Toyota manufacturing environment in the 1940s. The main principle is to carry the work in the most efficient way by 'eliminating waste' that in practice means avoiding anything that does not create value for the customers (Pharro, 2011:6). In the context of a Start-up, waste can be described as anything that inhibits the team of the Start-up from learning about how to deliver value for the customers (Ries, 2011).

'Lean' principle appears in applications under different names such as 'Lean Manufacturing' (LM), 'Lean Production' (LP), 'Lean Thinking' (LT), addressing different application domains, ranging from manufacturing systems to organizations in general (Putnik, 2012; 248) These all definitions include five pillars that enable Lean thinking and production (Womack and Jones, 1996): specify value, identify the value stream, flow, pull and perfection. From team and organization perspective Lean methods include standardization, discipline and control in order to create an uniformity of work; also continuous process of training and learning and organizational approach which is based on teamwork; encouraging to participate and empower people with extending the functions; need for multiskilling and adaptability in the team is one of the main principles, common values in the team that help to unify the mindset (Arbós et al., 2006, 219). To achieve the main goal of Lean a number of tools and techniques are being used as: Kanban, 5 S's, Visual control, Poke yoke, SMED (single minute exchange of dies) (Melton, 2005). During the time Lean expanded from tools and techniques to the whole philosophy that is being expressed through 'Lean Behavior (LB)' and 'Lean Thinking (LT)'. As Lean approach is strongly based on people, it addresses this aspect by seven skills that make people Lean (Howardell, 2011). The seven Lean People Skills are prerequisites for effectively applying Lean Enterprise tenets and tools: 1. Understanding Value; 2. Identifying and working the value stream; 3. Being Adaptive; 4. Taking the Initiative; 5. Innovating: Changing things for the better; 6. Having Collaborative outlook; 7. Leading from below. These skills are closely interconnected to 14 principles of Lean management (Table 1).

Table 1. The *Toyota* Lean Principles (Liker, 2004)

Principle 1	Base your management decisions on a long-term philosophy even in expense of short-term financial goals
Principle 2	Create a continuous process flow to bring problems to the surface
Principle 3	Use 'pull' systems to avoid overproduction
Principle 4	Level out the workload
Principle 5	Build a culture of stopping to fix the problems, to get quality right the first time
Principle 6	Standartised tasks and processes are the foundation for continuous improvement, employee empowerment
Principle 7	Use visual control so no problems are hidden
Principle 8	Use only reliable, thoroughly tested technology that serves your people and processes
Principle 9	Grow leaders who thoroughly understand the work, live the philosophy, and teach it to others
Principle 10	Develop exceptional people and teams who follow your company's philosophy
Principle 11	Respect your extended network of partners and suppliers by challenging them and helping them to improve
Principle 12	Go and see yourself to thoroughly understand the situation
Principle 13	Make decisions slowly but consensus, thoroughly considering all options; implement decisions rapidly
Principle 14	Become a learning organization through relentless reflection and continuous improvement

The **Lean Project Management** concept evolved from Lean manufacturing an construction industry (Figure 3) Standardization of processes is one of the Lean approaches in large scale projects. Lean Project Management is a comprehensive outcome of other Lean principles and has many ideas in common. Still the main definition of Lean Project Management is delivering more value with less waste but in the context of the project (Azharul, 2010: 2). Project as a value stream: Azharul (2010: 10) defines that project should be seen as a process – a stream of activities and inputs, processing and outputs. Lean principles reflect as processes become work packages. In the perspective of value stream in Lean Project Management weak links in project chain need to be identified and eliminated, mainly focusing on tasks or deliverables dependencies but not on deadlines. In order to achieve that strong routine needs to be built in form of 'Work Breakdown Structure': responsibilities with deliverables and milestones, visibility to detect the relations. Fourteen Lean principles (Table 1) are the core pillar of Lean Project Management and they can be easily adapted in each of five Project Processes Groups by PMBoK. For example, in Planning Process Group principles 2, 3, 4, 6 can be used to organize planning - as in Lean project management the planning processes are carried out by the whole team (not only project manager), the team creates the structure and processes describing how project will be delivered in a simple, efficient and repeatable way. Principle 12 unveils in execution process as team member have to feel their value in the team and that they can contribute in achieving organizational goals. A very important aspect is tasks assignment according team members' strengths where person can perform and can get motivated simply executing tasks that he/she likes. Monitoring and Controlling in Lean team is led by constant improvements and there's whole philosophy behind that: according to the principle 14 the Lean team will never be satisfied with 'status quo' and will always try to find ways for continuous improvement – to make it easier, faster, safer.

Agile Project Management for Start-up creation: This methodology was founded and still is widely used for software development projects in product development cycle. During years of practice the methodology developed to whole Project and Business Management concepts that use 'Agile Manifesto' and main principles. According to the Merriam-Webster on-line dictionary 'agile' means: "1: marked by ready ability to move with quick easy grace; 2: having a quick resourceful and adaptable character." In agile software development, 'agile' tends to mean 'the ability to respond to change' (Hodgetts, 2004: 7). In the context of organization, According to PricewaterhouseCoopers' 11th Annual Global CEO Survey (PWC, 2008), executives all over the world around the world evaluated their companies in the area of Agility: 76 % stated that their ability to adapt to change will be a key factor of competitive advantage in the next years, as they assume that environment will change constantly so their organizations will keep on developing their Agility. Agile theory assumes that changes, improvements and additional features will be incorporated throughout the product development life cycle and the changes are perceived as an opportunity to improve but not as a failure (ESI International, 2010: 2). There are several different approaches of Agile methods but they all have some basic concepts that, in the wider point of view, are based on core principles defined in 'The Manifesto for Agile Software Development' (Cervone, 2011:19):

The core Agile principles: Our highest priority is to satisfy the customer through early and continuous delivery of valuable:

- Changing requirements should be welcomed, even late in development. Agile processes harness change for the customer's competitive advantage.
- The delivery of working [products] should be frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
- Business people and developers must work together daily throughout the project.
- Projects should be built around motivated individuals. Give these individuals the environment and support they need, and trust them to get the job done.
- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
- Working [products] is the primary measure of progress.
- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility.
- Simplicity — the art of maximizing the amount of work not done — is essential.
- The best architectures, requirements, and designs emerge from self-organizing teams.
- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly."

Even though Agile Manifesto was dedicated for software development but the main principles are being applied widely in other management areas, for example, Project Management. This is were the concept of Agile Project

Management evolved from – as an approach how projects suppose to be managed what often contrasts to Traditional Project Management but at the same time can complement it. Agile Project Management is an approach to project management based on agility but maintains the concept of a project, its delivery and project management. The methodology applies a very flexible but at the same time controlled process that is used to deliver solutions, it combines the effective and efficient use of the knowledge of the project team with techniques as iterative development and modeling in order to fit into strict project delivery timescales (Pharro, 2011: 4).

Agile Project Management Methods contrast with Traditional Project Management Methods as Agile is focused on delivering working products (or prototypes) for client evaluation and optimization while 'predictive' project management methods suggest that defined requirements and set of activities can be planned and forecasted in the very beginning of the project. This mostly is applicable for software development projects. One of the advantages of Agile Project Management for the organization is that it does not have to replace the existing project management methodology in order to successfully implement projects in the corporate environment. Agile Project Management can complement other methodologies by bringing more team or customer based approach. As Pharro (2011: 6) defines: "There is no need to develop and integrate company-specific Agile management processes, the organization can simply adopt a tried and tested approach". Even though Agile approaches are in the contrast to traditional project management views as traditional project management is mostly based on planning and lighter on execution and control as there is an assumption that execution of activities that are defined in the project plan should be an easy task after a properly prepared project plan. However, in the software development, projects have higher risks associated to production.

There are core benefits of incorporating Agile Project Management in Start-up business creation because it brings incremental development process and constant customer and other stakeholders feedback, more simple and flexible organizational structure, efficient communication, direct involvement of the entire team in the project delivery. And according to the scope of the thesis, Agile can complement Traditional Project Management approach in the area of Project Process Groups by PMBoK. One of the advantages of Agile Project Management for the organization is that it does not have to replace the existing project management methodology in order to successfully implement projects in the corporate environment. Agile complements other methodologies by bringing more team or customer based approach. As Pharro (2011: 6) defines: "There is no need to develop and integrate company-specific Agile management processes, the organization can simply adopt a tried and tested approach". Although, Agile approaches might be in the contrast to traditional project management as it is mostly based on planning and lighter on execution and control and there is an assumption that execution of defined activities (in the project plan) should be an easy task after a properly prepared project plan. However, in the software development, projects have higher risks and uncertainty to be planned from the beginning till the end by the first planning round so it is always useful to divide project into different cycles with different approaches on planning (and other process groups) in each of them. Denning (2012) states that: "Most Agile Methodologies do not define any project management processes. Whether we're agile or not, we need to manage project scope, planning, budgets, strategies, and reporting. But Agile approach

in Project Management helps to solve a specific management issue - how to combine disciplined execution with creativity and innovation." Collet (2009) points out: "Unless you choose an agile methodology that encompasses all needed processes, you should combine it with a methodology that define these processes and rely on agile for day-to-day team management.

Concluding, the Start-up creation process can be 'seen' as a project in order to apply project management methods. One of the most used methodologies is the PMBoK Guide that suggests divide project into cycles and the cycles into processes, the guide contains step-by-step actions and techniques gathered from best project management practices throughout the knowledge areas. In Internet Start-up creation (especially software development based) other methodologies as Agile Project Management and Lean Start-up are being used. The principles of these two methodologies can be also easily applicable in overall Start-up business creation, depending on the type of the Start-up and the management approach of the founders. Overall, all these methodologies suggest many beneficial methods, therefore founders have to indicate which would be the most suitable for their Start-up. Those methods can be combined by creating a customized management system, because some of them are more focused, for example, on strict procedures and documentation and others on flexible and customer needs based approach. But in order to be able to create project management approach the founder has to have certain management knowledge and skills. Next section contains a short overlook on how founders can gain management and entrepreneurial skills.

Methodology of the research

The paper research is based on a qualitative research method - a case study of a Start-up project *Blendlee*. The empirical research is based on data from primary sources: direct observations of one of the founders of *Blendlee* (the author herself), an open-ended interview with the second founder. Moreover, as the author has full access to all strategic, operational, planning documents of *Blendlee* – this is the third primary source for data. The secondary data sources are scientific literature material (books, articles, degree thesis, publications, etc.), data from statistical databases, research reports, informational Internet portals, interviews, on-line courses, etc.

The Unit of Analysis: The case of *Blendlee* has all characteristics of an object for a case study as it is a complex and functioning unit, it was investigated in its natural context with multitude of methods and it is recent and still on-going so it is contemporary (Johansson, 2003: 2).

The Case of Blendlee: For the empirical research the case of Blendlee was chosen as a successful case study because its Business Concept and Business Plan won first place in open international students competition Ericsson Innovation Awards 2015. The task of the competition is to create an innovative solution to solve a problem that is applicable to the global community. This years' topic was: 'Innovation for the future of learning', and totally there were 370 projects submitted. Blendlee victory in the competition verifies that the approach of combining Project Management Methods in creating Business Plan of the Start-up was successful and the case can be used as an example of a good practice. The concept of competition is designed as a business plan competition because during the phases of competition the teams had to submit:

1 phase: Detail analysis of the problem and the concept of innovation to provide a solution; Video that would illustrate the problem and suggested solution.

2 phase: A Market research report of a conducted market research to verify the feasibility of the concept (customers needs, competitors analysis, market size and potential, etc.); Detailed product description; Business Plan.

The participants of the competition were two students from The European Master in Project Management in Fachhochschule Dortmund - University of Applied Sciences and Arts: Double Master degree student Jolita Kiznyte from Kaunas University of Technology and Marcos Welker. Students created a very comprehensive and integrated solution of an Internet platform: "*Blendlee* is an integrative internet platform for personal and professional development, talent discovery and job matching. It blends personal elements, focused learning material and requirements of the market. It considers at the same time the never-ending need of individuals for development and the steady growing demand for talented professionals. It is the first and only platform, which takes a comprehensive approach to individual development – it combines high quality information, human connection, equal access, individualities approach, personal strengths, guidance and interaction between people - physically and virtually (*Blendlee* product description document)."

The Case Reliability: All submitted documents were evaluated by a six members jury of experts in various fields. The high evaluation of *Blendlee* Business Plan by the expert jury testifies the success of the case and taking into account that all jury members are from different areas of business (Sustainability and Corporate Responsibility, business creation and development, education, marketing and communication, business intelligence) it means that the Business Plan was evaluated and analyzed in many different perspectives. The feedback about the concept: *"Blendlee did a great job of structuring a combination of educational activities into personal goals and strength assessment. Brining in a coaching community, taking a lifetime learning approach and mixing in certifications and goal mapping was appreciated by the judges."*

The Research Questions:

- What were the goals and benefits of Business Plan in case?
- Why Start-up creation process was based on Project Management approach and what approach?
- What was the approach on using Project Management methodologies in Business Plan Cycle?
- What was the approach on using Project Management Methods in each of Business Plan Cycle Process Groups?
- How important was the teams' Skill-set in *Blendlee* Start-up business creation?

Sources of evidence (Yin, 1994): direct observations, interview, archival records, documents, participant observations, physical artifacts. For this case study the following sources of evidence were selected:

- Documentation: strategic, operational, planning documents of Blendlee;
- Interview: the interviewer - one of Blendlee founders Marcos Welker, the interview was designed to answer research questions with additional comments of interviewer;

- Participant observations: as the author is one of the founders of the Start-up she provided participant observations from her own experience in working with the project.

The Interview: In order to reveal the combination of Project Management methods used in *Blendlee* Business Plan Cycle the author conducted an interview with one of the founders Marcos Welker. He is a PMP certified project manager who has over that 10 years experience leading the projects in Brazil and Germany so he was a credible expert on this topic. In each of the topics the research question was defined and according to them the interview structure was created. Interview was conducted after the Business Plan Cycle was just finished so comments and authors' direct observations (she participated in the whole process) were accurate.

Framework for Case Analysis: Analysis of *Blendlee* case is based on PMBoK Project Process Groups and Project Cycle approach in Start-up business development. The founders compared the Start-up creation to a project. Figure 9 illustrates the Project Cycle approach which was chosen by *Blendlee* founders, overall they created four cycles: Business Plan Cycle, Business Establishment Cycle, Platform Development Cycle and Business Growth Cycle. The scope of analysis is Business Plan Cycle – each of the process groups will be analyzed in order to find out what kind of Project Management methods, principles, tools and techniques combination was chosen in this case of successful Business Plan creation

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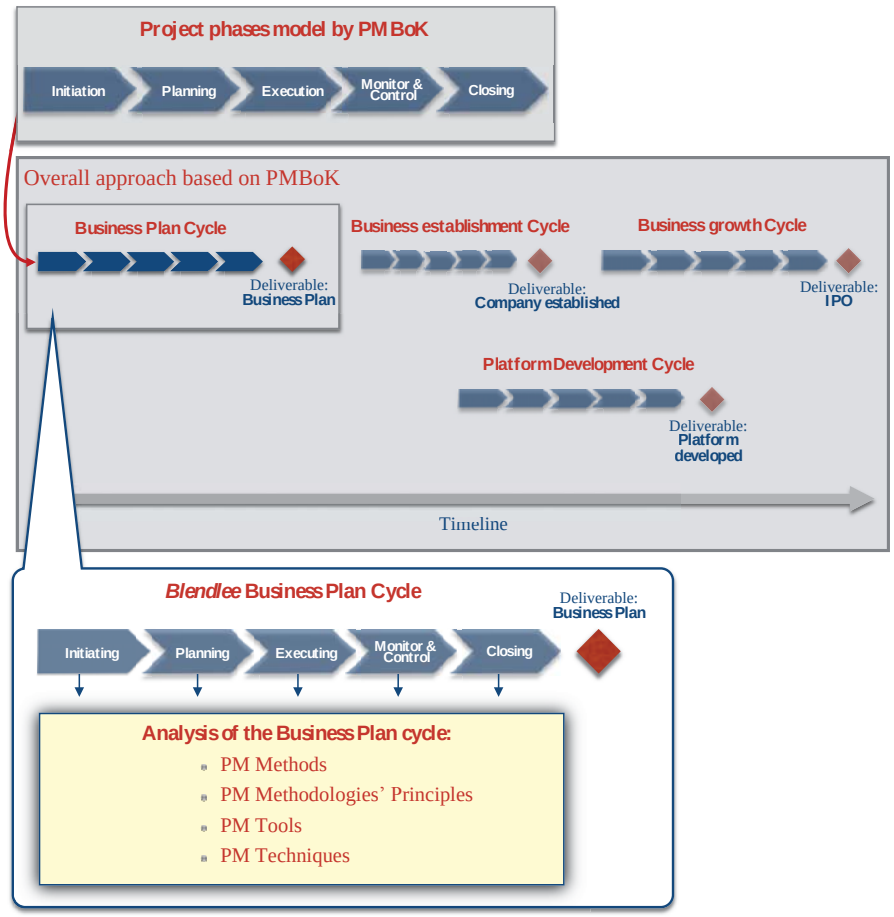

Figure 3. The framework of the case analysis (created by author)

Research results and discussion

The influence of team composition for the success of the deliverable: In Blendlee Business Plan creation case one of the main success factors was a balanced team in perspective of profile – both of the founders have entrepreneurial profile and knowledge of business management. Also complementary skillset – Marcos has an IT background and more hard skills and Jolita administrative background with more soft skills. These profiles were combined with Project Management knowledge and created a very good combination for the business. What is more, both founders were highly dedicated and had a self-directed learning mindset that helped them to acquire new skills that were crucial to deliver the Business Plan.

Project Management approach on Blendlee Start-up creation: The founders of *Blendlee* as a basis for their Start-up creation chose *PMBoK* suggested approach on project management. Firstly, the Project Cycle method was applied for the overall business creation process. According to the type (IT Start-up) and size of the company the founders divided the process into four cycles: Business Plan Cycle, Company Establishment Cycle, Platform Development Cycle, Business Growth Cycle. The main reason was that it helps to reach the main goal by setting transitional milestones, in other words what needs to be done to complete the work. In *Blendlee* case the transitional milestones were: Business Plan document delivered, Company established, Platform fully developed, Business Exited (Initial public offering - IPO). The Start-up recently successfully finished the Business Plan Cycle and at this moment is the following one so the scope of the deeper analysis was limited to finished Business Plan Cycle because there is a result reached the author could make assumptions that the approach used by the founders was successful and can be applied for other Start-ups as well.

Another method that is inherited by *PMBoK* – Project Process Groups approach – was applied in *Blendlee* case as well. The founders decided to use five process groups: Initiating, Planning, Executing, Monitoring and Controlling, Closing. The process groups describe what actions have to be taken in order to manage the project. *PMBoK* suggests detailed guidelines and outputs (documents) for each of the process groups and the team used many of them in their Business Plan Cycle to create a sequence of actions that need to be done in order to deliver a winning business plan. Also *Lean Start-up* creation phases were used in *Blendlee* case: *Business Model Canvas* which was used as a tool to create a draft version of Business Plan, it was changed and rearranged many times during the creation process, every time improving it; *Customer Development* was used in form of market research which contained a global survey in order to get feedback on the solution from potential users/customers. The survey and feedback let to define the main problems and according to those problems create a solution that would address and satisfy the needs of the users/customers; 'Minimum Viable Product (MVP)' – the platform is very complex so that was the reason why the founders decided in the future cycle to create a MVP that would attract first users/customers, generate first cash flow, let test and improve the feature, gather more feedback on the solution, etc.

Application of Project Management Methods in *Blendlee* Business Plan Cycle: The paper was focused on deeper analysis of *Blendlee* Business Plan Cycle which main deliverable was the Business Plan document with smaller

transitional deliverables (for example, market research report, financial forecast, product description, etc.). As the founders in each of the cycles chose to use Project Process Groups approach which was developed by combining three Project Management Methodologies: PMBoK, Lean Start-up and Agile Project Management. Each of the process groups was analyzed step-by-step in order to find out what was the combination and proportion of each of the methods used that are suggested by these three methodologies. The basis for all process groups was PMBoK methods (for example, creating project charter, project plan and schedule, project status reports, etc.) but they were also complemented by Lean Start-up and Agile Project Management methodologies. The main reason why the founders chose to combine these three methodologies was the type of business (an IT Start-up) as Lean and Agile approached are widely used in software development projects, the goal was to create a company's management culture based on principles of these methodologies. In the Business Plan Cycle there was no software development so the number of methods used comparing to PMBoK is smaller but it is important to mention that, for example, in further cycles (Platform Development Cycle) the basis still will be the Project Process Groups by PMBoK, but processes will be managed using more methods from Lean and Agile than from PMBoK. The combination of different methods helped to adapt to a fast changing environment and choose the most efficient tools and techniques to carry the work. PMBoK is being criticized by practitioners as a methodology that lacks of flexibility but managers can always chose which methods they want to use and, for example, the founders of *Blendlee* created their own framework that was combined from several methodologies.

The combination of Project Management Methods in *Blendlee* Business Plan Cycle: PMBoK was the main pillar of implementing project process groups, it provided the whole procedures framework with possibility to chose from a wide range of management methods. The founders chose o create their own framework, taking into account PMBoK Knowledge Areas that helped to follow the course of the project. Lean and Agile methods and principles helped to create a solution that was based on users/customers needs that were unveiled by receiving feedback, conducting a survey, making the market research. Both of methodologies provided methods that helped to stay flexible on scheduling but strict on controlling in order to improve the results and efficiency. *Lean principles* helped to create a team culture that was based on learning and constant improvement of the results, the founders were gaining many new skills during the process in order to be able to deliver the tasks. The working environment was built on teamwork and collaborative decision-making, team members gave an open feedback and constructive criticism to each other (this aspect also is applicable in Agile Project Management). *Agile* enriched the combination of Project Management Methods by bringing technical excellence approach on execution, for example innovative approach on business plan design was chosen. Also techniques as 'Mini Scheduling' was used to create a structure of daily tasks which was followed by iterative controlling and 'Daily Standup Meetings' that let the founders to organize an efficient workflow. After analysis of the case the author summarized the results into a step-by-step actions framework. The full framework of combination of Project Management Methods in *Blendlee* Business Plan Cycle can be seen in Figure 4, it shows certain actions taken and reveals the proportion of methods in each of the cycle process groups.

The future of the research: The scope of this master thesis was limited to only one cycle of the Start-up creation, which was already finished when this thesis was written. In this way, the author could make analysis of the results of this cycle and of what was delivered. As the outcome of the cycle was very positive – a winning Business Plan –, it was a compelling topic to research which methods helped achieve that result.

There are opportunities to conduct further research on the application of Project Management Methods in Start-up creation concerning the same cycle evaluated in this work, but also concerning future cycles, as for example, 'Platform development' or 'Company establishment'.

Blendlee recently started a forthcoming cycle, applying even more Project Management Methods, as their usage in the previous cycle showed to bring many benefits. Consequently, there is a possibility for the author to research on the same topic - application of Project Management Methods in Start-up creation –, however in relation to next cycles. The research will be then highly relevant when following cycles of the *Blendlee* implementation will be finished and results will be achieved.

Conclusions

1. The research has shown that one of the key Start-up success factors is evaluating the feasibility of their business idea and creating a realistic business model. Many entrepreneurs fail in the early stage of the venture because their business planning is poor, or there is no business planning at all. According to the scientists, one of the most valuable tools to start creating a new venture – The Business Plan – if often left out, being considered as an unimportant or costly document that takes to much time and effort to create. The research showed that this happens mainly because the founders do not have certain skills that are needed to create such a document or they do not have the knowledge on the value and benefits of a well-prepared Business Plan. This is another success factor – skills evaluation. In order to prevail with their businesses entrepreneurs have to possess or develop a certain profile that is a combination of knowledge, skills/know-how and personal traits. However, in many cases this combination is not fully considered. The same is applicable in the teams' composition.
2. The scientific literature review showed the possibilities of applying Project Management methods and methodologies in Start-up business creation. One of the most widely used methods for project management is the Project Cycle approach, which can be easily comparable to phases of business creation, where the whole process can be divided into several phases, or 'project cycles'. The PMBoK also suggests five Process Groups with step-by-step actions and methods on how to efficiently manage the tasks, in order to achieve intermediate deliverables of the project cycle. Because the Start-up business environment is highly dynamic, other scientists argue over the usage of the PMBoK methodology in this field, as if it would be flexible enough to provide a full combination of methods that would fit Start-ups in all areas of management. This is why they suggest a combination of several different methodologies in order to find the best fit for each specific Start-up.

   The literature review concluded that Agile Project Management and Lean Start-up methods can bring more flexibility and customer oriented approach in project management, and that PMBoK is highly beneficial in defining and

efficiently managing the business processes. The research suggests that these methods, when combined, can be used for a more comprehensive management process, thus leveraging the possibilities of success in Start-ups creation.

3. In accordance to the theory that project management methods can be combined to offer a more customized solution for Start-ups, Blendlee used the combination of PMBoK, Agile and Lean, each with a different weight and role.

   The largest part of the combined methods for Project Management in the *Blendlee* case derived from PMBoK. According to the Project Cycle approach from that methodology, the founders divided the Start-up creation into four cycles: Business Plan cycle, Company Establishment cycle, Platform Development cycle and Business Growth cycle. This approach helped create an overall business management approach and structure the business creation processes using the Project Process Groups.

   Another part of the combination was supplied by Lean Management principles and methods, which based the whole Blendlee culture. The main characteristics were: the solution was created responding directly to the market and users/customers needs; the work was carried out mainly working in the team; the team was highly dedicated to the project vision and had a learning and knowledge sharing mindset; the whole execution process was driven by constant improvement in efficiency and quality of results.

   The last piece of the mixture came from Agile principles and methods. Even though Agile is commonly used for software development, it has also been employed for overall Project Management. This was confirmed in the *Blendlee* case, as they were used in an initial business, non-software development phase as, for example: work was organized in iterative cycles and collaborative decision-making manner; constant result improvement; cultivating excellence in the execution of all tasks; creation of an atmosphere of open feedback and constructive criticism (as a principle).

Recommendations

- Before creating a business venture it is very important that person would assess if he/she has the potential, motivation and entrepreneurial profile that is a combination of certain knowledge, skills and personal traits needed to create and run the business.
- Another important aspect is the composition of skills in the Start-up team. The perfect combination is a complementary skill-set, for example, person with a profile of dominating hard skills would complement the team member who has developed more soft skills. What is more, the mindset of constant learning and knowledge sharing is highly beneficial in Start-up creation, as the environment changes very fast, there is a high demand on gaining new skills throughout all phases of the business.
- An approach on applying Project Management methods in Stat-up creation can vary depending on the type of the Start-up. In order to tailor the most suitable approach an essential action is to gather the knowledge about different methodologies. After this, evaluate what is most important for the Start-up (the goal) then, follows the identification of which methods could be applied (which can be used, which should be left out or modified).
- If the founders are planning to use the project cycle approach for dividing business into different cycles, they have to define their own cycles according to their case, for example, considering timing (too long cycles have side

effects), resources (too large cycles need more resources, more capacity to deliver the result), knowledge (to manage large cycles more knowledge needed).

References

[1] Arbos, Cuatrecasas, L., Olivella, N. J. (2006). *Shop-floor work organization in a lean factory: a set of indicators*

[2] Archibald, R. D., Di Filippo, I., & Di Filippo, D. (2012). The six-phase comprehensive project life cycle model including the project incubation/feasibility phase and the post-project evaluation phase. *PM World Journal*, *1*(5), 1-40

[3] Azharul, K., Nekoufar, S. (2010). Lean Project Management. In Large Scale Industrial & Infrastructure Project via Standardization. Faculty of Built Environment and Engineering, Queensland University of Technology. Retrieved from http://projectmanager.com.au/wp-content/uploads/2011/03/LeanPM_Saviz-Nekoufar.pdf

[4] CB Insights (2015). *The Top 20 Reasons Startups Fail*. Retrieved from https://www.cbinsights.com/research-reports/The-20-Reasons-Startups-Fail.pdf

[5] Cervone, H. F. (2011). Understanding agile project management methods using Scrum. *OCLC Systems & Services: International digital library perspectives*, *27*(1), 18-22

[6] Collet, B. (2009). *Agile limitations*. General format. Retrieved from http://www.brunocollet.com/2009/01/agile-limitations.html

[7] Denning, S. (2012, April 17). The Case Against Agile: Ten Perennial Management Objections. Generalformat. Retrieved from http://www.forbes.com/sites/stevedenning/2012/04/17/the-case-against-agile-ten-perennial-management-objections/

[8] Dollinger, M. J. (2008). *Strategies and Resources*. Singapore: Pearson's Educational. Bygrave, W. D. (1997). The Entrepreneurial Process. The Portable MBA in Entrepreneurship. New York: John Wiley & Sons

[9] ESI International (2010). *Successful Solutions Through Agile Project Management.* White paper. Retrieved from http://www.esi-intl.com/government-solutions/government-training-programs/~/media/Files/Public-Site/US/WhitePapers/ESI_Agile-WP.ashx

[10] Faley, T. (2005, August 1). *The Process of Business Creation*. General format. Retrieved from http://www.inc.com/resources/startup/articles/20050801/process.html

[11] Graham, P. (2012, September). *Startup Equals Growth, in Graham's Essays on entrepreneurship*. General format. Retrieved from http://www.paulgraham.com/growth.html

[12] Gumpert, D. E. (1997). *Creating a Successful Business Plan*. The Portable MBA in Entrepreneurship. Ed. W. D. Bygrave. New York: John Wiley & Sons

[13] Haughey, D. (2014). Project Management Methodology Explained. Retrieved from http://www.projectsmart.co.uk/project-management-methodology-explained.php

[14] Hodgetts, P. (2004). Agile Planning, Tracking and Project Management Boot Camp. XP Agile Universe Conference Calgary, Alberta. Retrieved from https://www.agilelogic.com/files/ProjectManagementBootcamp.pdf

[15] Howardell, D. (2004). *Lean people for a lean enterprise*, The ACA Group. Retrieved from www.theacagroup.com/leanarticle.htm

[16] International Federation of Accountants (IFAC) (2006). *Business Planning Guide: Practical Application for SMEs.* International Federation of Accountants, New York. Retrieved from http://www.cpaireland.ie/docs/default-source/business-resource/ifac-business-planning-guide---practical-application-for-smes.pdf?sfvrsn=2

[17] Johansson, R. (2003). Case Study Methodology. Royal Institute of Technology. Retrieved from http://www.psyking.net/htmlobj-3839/case_study_methodology-_rolf_johansson_ver_2.pdf

[18] Liker, J. (2004). *The Toyota Way: What Toyota Can Teach Any Business About High Quality, Efficience, and Speed*. McGraw-Hill

[19] Lundlam, A. (2015). *Six Reasons Why You Must Have A Business Plan*. General format. Retrieved from http://www.syob.net/start-business/why-have-business-plan/551
[20] Marmer, M., Herrmann, B. L., Dogrultan, E., Berman, R. (2012). *Startup Genome Report. A new framework for understanding why startups succeed.* Retrieved from https://s3.amazonaws.com/startupcompass-public/StartupGenomeReport1_Why_Startups_Succeed_v2.pdf
[21] Melton, T. (2005), The benefits of lean manufacturing – what lean thinking has to offer the process industries, Trans I ChemE, Part A, June 2005, Chemical Engineering Research and Design, Vol. 83 No. A6, pp. 662-73
[22] Mulcahy, R. (2009). *PMP Exam Prep: Rita's Course in a Book for Passing the PMP Exam*. RMC Publications, Inc.
[23] Nixon (2015, February 15). *Top 5 Benefits of good Business Process Management*. General format. Retrieved from http://blog.comindware.com/leadership/benefits-of-business-process-management/
[24] Pendrith M. (2014). *12 Reasons why new Business fail*. General format. Retrieved from: http://www.evancarmichael.com/Starting-A-Business/866/12-REASONS-WHY-NEW-BUSINESSES-FAIL.html
[25] Pharro, R. (2011). Agile Project Management, White Paper. APMG International. Retrieved from http://webcache.googleusercontent.com/search?q=cache:DZWPy3BIzfAJ:www.apmg-international.com/nmsruntime/saveasdialog.aspx%3FlID%3D4375%26fileName%3DAgile_PM_White_Paper_-_Feb_11.pdf+&cd=1&hl=lt&ct=clnk&gl=de&client=safari
[26] PricewaterhouseCoopers' (PWC), (2008). Compete & Collaborate. 11th Annual Global CEO Survey. Retrieved from http://pwc.blogs.com/files/ceo-global-survey---full-report---18883_ceo1_survey_82pp.pdf
[27] Putnik, G. D., Putnik, Z. (2012). *Lean vs agile in the context of complexity management in organizations*. The Learning Organization, 19(3), 248-266
[28] Ries, E. (2011). *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*. Random House LLC
[29] Scarborough, N. (2012). *Effective small business management: an entrepreneurial approach*. Pearson: New Jersey
[30] Schumpeter, J. (1942), *Capitalism, Socialism and Democracy*, New York: Harper
[31] Seifert, R. W., Leleux, B.F., Tucci, C.L. (2008). *Nurturing science – based ventures*. Springer: Berlin
[32] The Economist (2014, January 18). *A Cambrian moment*. Special Report Tech Startups. Retrieved from http://media.economist.com/sites/default/files/sponsorships/%5BKY56b %5DHuawei/180114_SR.pdf
[32] The Economist (2014, January 20). *Technoglobe*. General format. Retrieved from http://www.economist.com/blogs/graphicdetail/2014/01/internet-startups
[33] Timmons, J. A. (1994). *New Venture Creation: Entrepreneurship for the 21st Century*. Boston: Irwin
[34] Titus S. (2004). Key Reasons why small Business Fail. Accredited Associate of the institute of independent business. General format. Retrieved from: http://www.summitbusinesssolutions.ws/docs/reasons_biz_fail.pdf

How to shape Project Organization Management?

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Abstract

The concept of project organization is quite undeveloped and outdated in different aspects in project management standards. The paper focuses on shaping project organization in PMBOK® [7] and makes a proposal to create a separate knowledge area on Project Organization Management.

Key words: *project management, project organization management, organizational project management*

Introduction

Since the work in project teams has become one of the most popular organizational forms, a concept of project organization should be sufficiently embedded in all project management standards, including PMBOK® [7]. However, at the present time PMBOK® pays attention only to permanent organizations and the concept of organizational project management with a link to portfolios, programs, and projects together.

The paper makes an overview of project organization in such standards as PMBOK® [7] and IMPA OCB [4] and draws a conclusion, that the area of project organization is not sufficiently covered in PMBOK®. Therefore, a proposal to create a separate knowledge area on Project Organization Management with processes for all process groups is made in the end of the paper.

1. Project Organization Management/Organizational Project Management

Before making remarks on how to shape project organization in PMBOK®, it is important to distinguish between two concepts: Organizational Project Management and Project Organization Management.

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The Project Management Institute [8] defines Organizational Project Management as “a strategy execution framework that utilizes portfolio, program, and project management as well as organizational-enabling practices to consistently and predictably deliver organizational strategy to produce better performance, better results, and a sustainable competitive advantage” [8]. In the first chapters of PMBOK®, the concept of Organizational Project Management is also covered with regards to portfolio, program, and project management. By making a comparative overview of project, program, and portfolio management across several important aspects in an organization, such as scope, change, planning, management, success, and monitoring, PMBOK® emphasizes that Organizational Project Management focuses on interaction of portfolio, programs, and projects within an organization in alignment with its strategic goals.

Project Organization Management aims to “facilitate the interaction of people to achieve the project’s ultimate goals within the specified constraints of scope, schedule, budget and quality” [9] by “setting up the infrastructure to effectively and efficiently manage a project” [6].

Based on the overview of two concepts above, it can be seen that they differ greatly in terms of scope covered by each of them. While Project Organization Management deals with creating the infrastructure to improve the project performance, Organizational Project Management performs more on a strategic level of an organization, focusing on a correlation between portfolio, program, and project management. The graphical representation of both concepts can be viewed below.

Figure 1: Organizational Project Management and Project Organization Management: Own source

The problem that appears after consideration of two concepts is that PMBOK®, a guideline for project managers, does not provide real solutions for organizational issues in projects, but rather focuses on the achievement of strategic goals of an organization and correlation between projects, programs, and portfolios, even though the guidelines for programs and portfolios already exist. Furthermore, project organization is now an issue for project audits, since it is included in project management audit areas according to DIIR [2]. Project auditors look for organizational structure, project roles and responsibilities, but they are not covered in PMBOK®.

2. Review of project organization in PMBOK®

The aspect of project organization is covered only superficially in PMBOK®, specifying only the basic terms and giving remarks to the general forms of organization. The information not only lacks some specific knowledge on project organization management, but is also outdated, being copied from the first versions of PMBOK®.

In the first chapters PMBOK® distinguishes among functional, matrix, and projectized organizations. The functional organization, in which each employee has one chief, and each department is autonomous from other departments, is displayed in figure 2 [7]. Though PMBOK® provides this type of organization in its last version, the information is very outdated, since pure functional organizational structure is seldom met today in modern organizations. The matrix organization combines the features of two organizational structures and is presented as a balance between them.

Projectized organization, shown in figure 3 [7], is presented as an opposite organizational form, uniting employees in project teams and giving a high authority to a project manager. PMBOK® only defines this organizational structure, without providing any further information. Projectized organizational structure is more applicable to today's organizations, therefore it requires more attention and details provided, as well as information on organizational development towards this organizational structure is required.

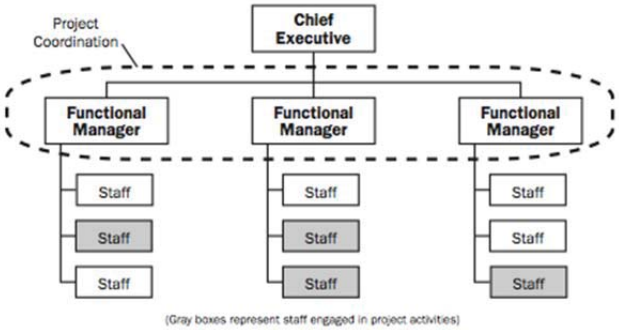

Figure 2: Functional Organization [7]

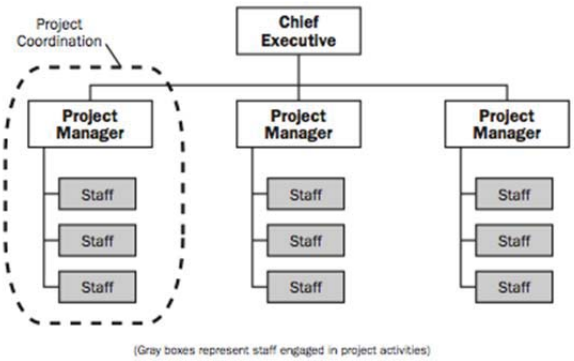

Figure 3: Projectized Organization [7]

Based on the remarks above, it can be observed that PMBOK® focuses mostly on permanent organizations, giving slight attention to temporary organizations. According to Gareis and Stummer [15], permanent and temporary organizations are integrated in project-oriented companies. “Projects as temporary organizations are started up, implemented, and closed-down concurrently. This creates a state of flux equilibrium, which shall ensure the company’s development and survival“ [15]. Since PMBOK® is a standard for project management, it should pay particular attention to temporary organizations in order to ensure the development of project organization.

Further reference is made to Project Management Office that aims to standardize project-related processes and promote “sharing resources, methodologies, tools, and techniques” among the projects [7]. Though PMO is used differently in several contexts, such as Portfolio Management Office, which functions more at a strategic level, Program Management Office and Project Management Office, which function at an operational level, the need for Enterprise PMO is growing, in order to ensure alignment between business goals and projects at a strategic level [1]. The link to EPMO to support individual PMOs and oversee all projects operated in the organization is also missing in PMBOK®.

PMBOK® introduces “Enterprise/Organization” box that consists of enterprise environmental factors and organizational process assets, which are included in almost all processes. The organizational process assets are considered to be very general and not connected with a particular program and the responsible PMO. Organizational process assets include mostly historical information, standardized guidelines, work instructions, organizational standard processes and policies, templates, lessons learned from previous projects, etc. The problem is that PMBOK® is concentrated mostly on the permanent organization, and only a slight attention is given to the project organization. A possible development to project organization is to develop organizational assets in regard to a particular process [10].

Some aspects of project organization are covered indirectly in other processes and knowledge areas of PMBOK®, as “Develop Project Team” in Project Human Resource Management or “Manage Communications” in Project Communications Management. However, existing knowledge areas and processes do not cover completely the area of project organization, which serves as “a backbone for a project” and assures that information, communication, and coordination are managed effectively through the whole project [6].

One of the steps to enhance the aspect of project organization is to rearrange the knowledge areas and create a separate knowledge area of Project Organization Management with separate processes focused on project organization through the whole project life cycle [14].

3. Review of the IPMA OCB standard on project organization

IPMA Organizational Competence baseline (IMPA OCB) [4] is a strong standard that discusses the concept of organizational competence in managing projects. It offers the insight of how project-oriented organization should look like and what role it plays in a project, as well as specifies how to manage projects, programs, and portfolios efficiently in an organization [5]. The standard considers projects as an integral part of an organization and emphasizes that continuous development of organizational competence in managing projects should be embedded into everyday activities of an organization.

The standard deals with various challenges and problems that organizations may encounter in project management. Those challenges may include but are not limited to technological development, permanent changes in society, economy, or politics. They should be though analyzed by each organization, in order to identify the relevant problems and apply the strategy, practices and processes to the specific challenge. Further, the standard provides different strategy guidelines that can help an organization to achieve its objectives and metrics.

The IPMA OCB recognizes two types of an organization:

- Permanent organization – it remains for an appreciable length of time;
- Temporary organization – it is created for particular projects and programs and is closed when they are finished [5];

Permanent organization contains top management unit and functional departments. Temporary organization includes mostly program and project organization, and permanent portfolio organization can be used for their coordination [5].

Figure 4: A project-oriented organization [5]

Project Management Office (PMO) is specified as an individual unit in an organization, and its role is highly emphasized. The interaction of projects, programs, and portfolios is presented with relationship to an organization. A team is presented as a smallest unit of an organization, which can be grouped with other teams, fulfilling the same purpose, into a department. Departments can be united into divisions, and an organization is then displayed as a utility of interconnected organizational units that have been combined to reach strategic goals of an organization [5].

The IPMA OCB separates organizational competence into the following five groups: PP&P Governance, PP&P Management, PP&P Organizational Alignment, PP&P Resources and PP&P People's Competences, which are divided into 18 competence elements [4]. All elements are interacted with each other and influence each other to a certain extent, depending on development of organizational competence in managing projects.

The IPMA OCB also serves as a framework for an IPMA Delta® Assessment and Certification that makes an assessment of "an organization's organizational competence in managing projects" and aims to develop this competence in an organization both in short and long perspective [5]. In order to ensure continuous organizational development, an assessment is made according to external quality systems. EFQM model [3] is a strong example of assessing the projects and programs with regard to fulfilled expectations of project stakeholders.

From the following quality assessment of organizational competence, it can be observed that IPMA OCB has a strong link to quality management. The mission of continuous development of an organization, alignment of organizational goals to satisfy stakeholders' objectives in a long perspective also contributes to sustainability management. Therefore, the IPMA OCB can be considered as a strong guideline to shape project organization.

4. Project Organization Management knowledge area

Project Organization Management has to

- prepare
- plan
- establish
- monitor and control, and
- close

the organization of a given project under given strategies and standards. Roles and responsibilities must be defined.

Project Organization Management is not developed in PMBOK®, and in order to develop it, a proposal is made to create a knowledge area on Project Organization Management with the following processes for the whole project lifecycle:

- Review Organizational Strategies and Organizational Assets
- Plan Project Organization
- Establish project organization
- Monitor and Control project organization
- Close project organization.

The new processes described here follow the general kind of process descriptions in PMBOK®. The processes have input from various sources and other processes as described in the figures further in the paper. The processes cover all process groups of PMBOK®, and a graphical representation of them can be viewed below:

Initiating	Planning	Executing	Monitoring & Controlling	Closing
Review Organizational Strategies and Organizational Assets	Plan Project Organization	Establish Project Organization	Monitor and Control Project Organization	Close Project Organization

Figure 5: Project Organization Management in all process groups: Own source

The first of these processes starts with a review of organizational strategies and organization assets to understand important preconditions for a project. We focus on organizational issues – not on financial issues or business cases for example. It is a process for the initiating process group and starts before planning a project.

Inputs for this process in the subsequent figure are:

- Enterprise environmental factors in general, like standards and laws at the locations of a company that starts a project;
- Organizational assets in general, like the company type also regarding legal aspect and owners;
- Project charter with first information about the project scope and core requirements;
- Project organizational strategies, like those dealing with the kind of projects a company runs. It is important to identify whether projects are more based on external resources (contract projects) or on internal resources that are collected and developed for a project;
- Organizational assets like PMOs and separate enterprise project management offices (EPMO);

- Project management guidelines should shape project organization;
- Project management systems that shape project organization, as well as communication and other processes in projects.

The results are collected in “Organizational Reviews” and transferred to the next process.

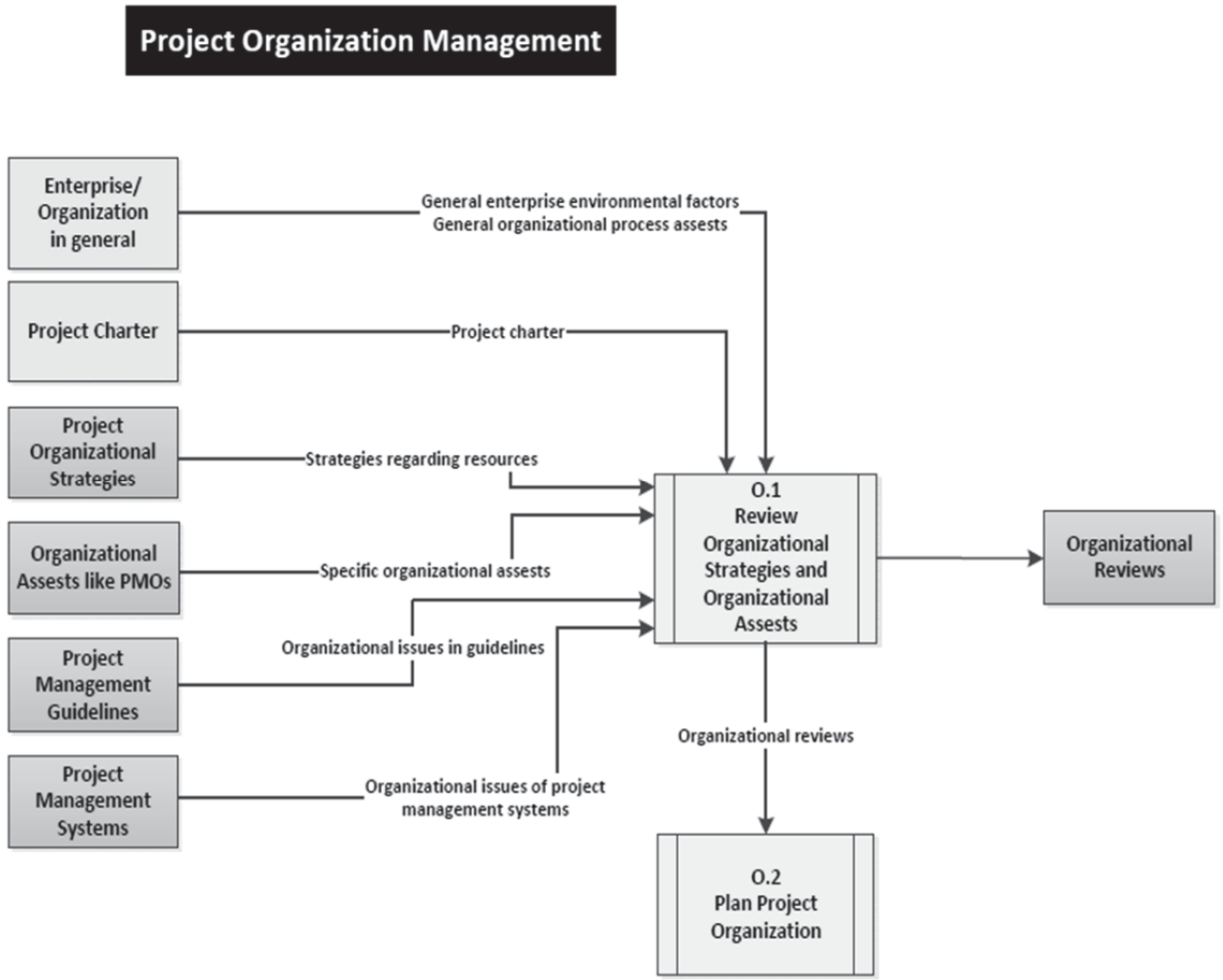

Figure 6: First Process in Project Organization Management (further developed from Reusch [9], 10])

The second process is focused on “Plan project organization”. It takes results from the reviewing process and shapes organizational concepts also based on a project charter, a preliminary stakeholder register and a preliminary project plan. The results include a project organizational plan or an updated plan in case a prior plan already existed. There is a plan regarding a PMO, the project group, working groups, ect. The plan includes a definition of roles and responsibilities – at least a preliminary one. There should also be a plan about involved functional units and other projects that have an impact on a new project or will be influenced by a new project. There should also be a plan of involved external resources.

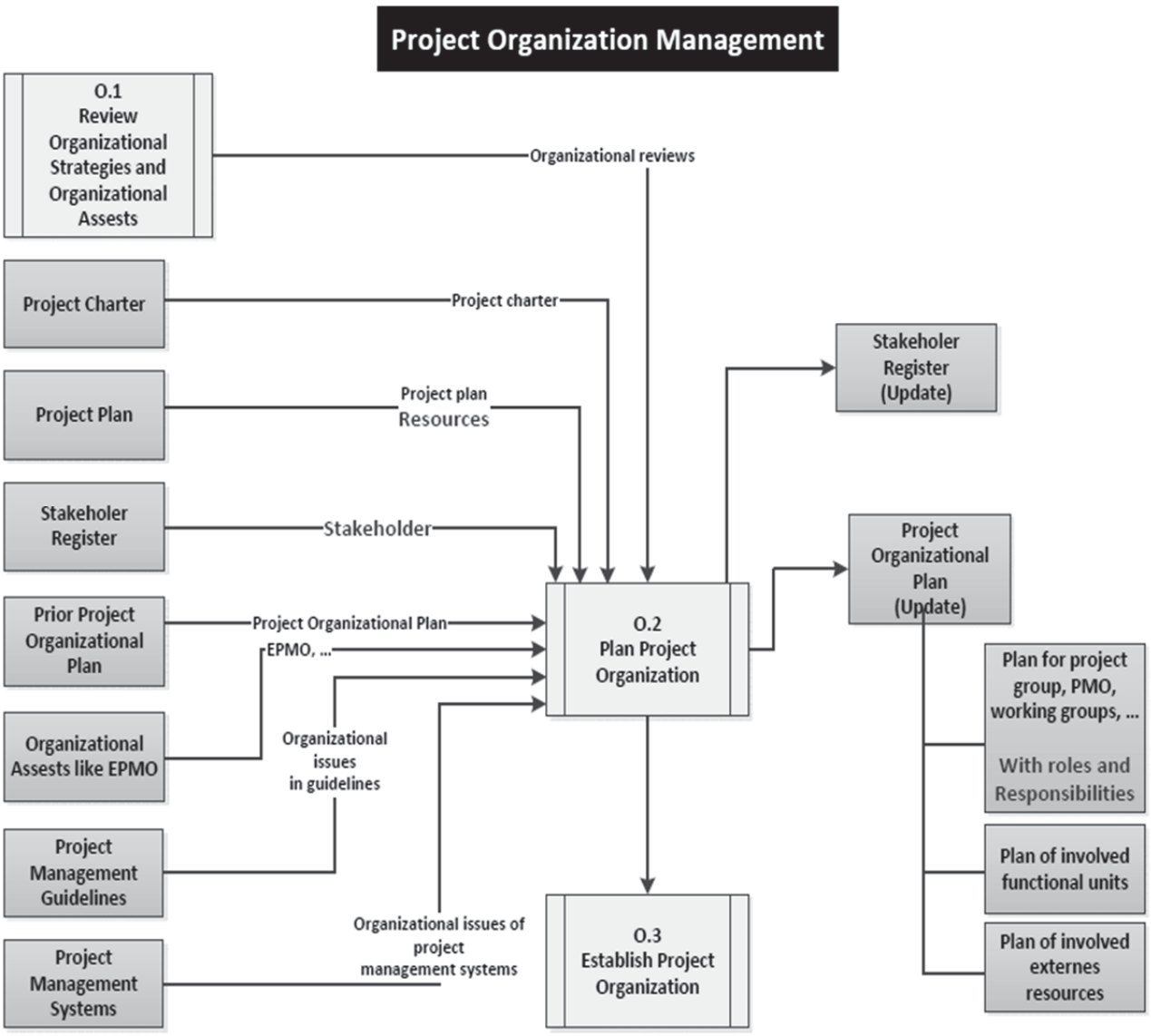

Figure 7: Second and third Process in Project Organization Management (further developed from Reusch [9], 10])

The third process deals with the implementation of the project organization according to the plan developed before – probably with some updates in several planning cycles. After the implementation of the project organization main work on the project can start and can be monitored and controlled by the subsequent process.

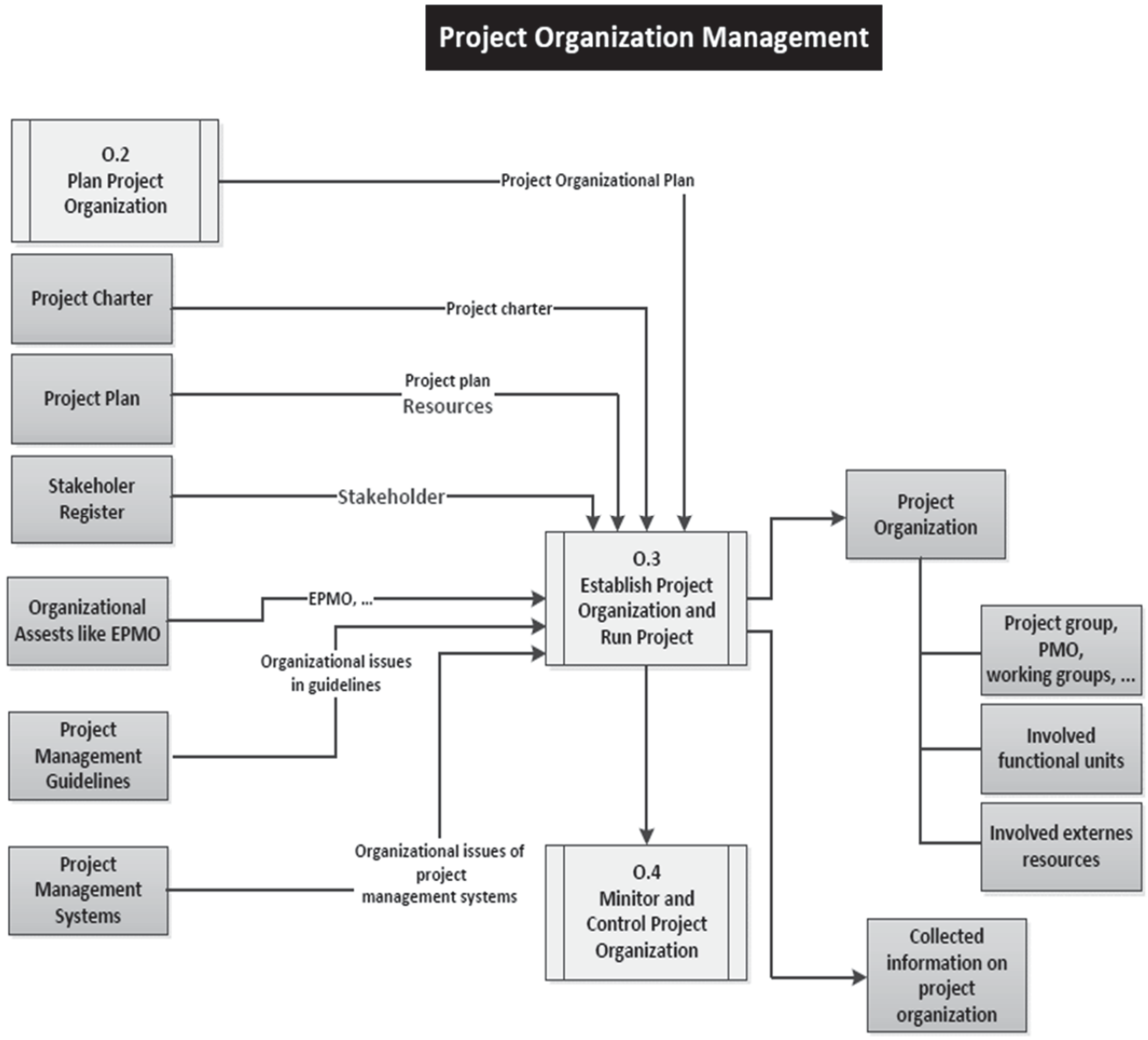

Figure 8: Third and fourth Process in Project Organization Management (further developed from Reusch [9], 10])

The fourth process focuses on monitoring and controlling of project organization, taking inputs from previous processes and providing project organizational updates as the main output. The results of this process serve as the main basis for the last process of closing project organization.

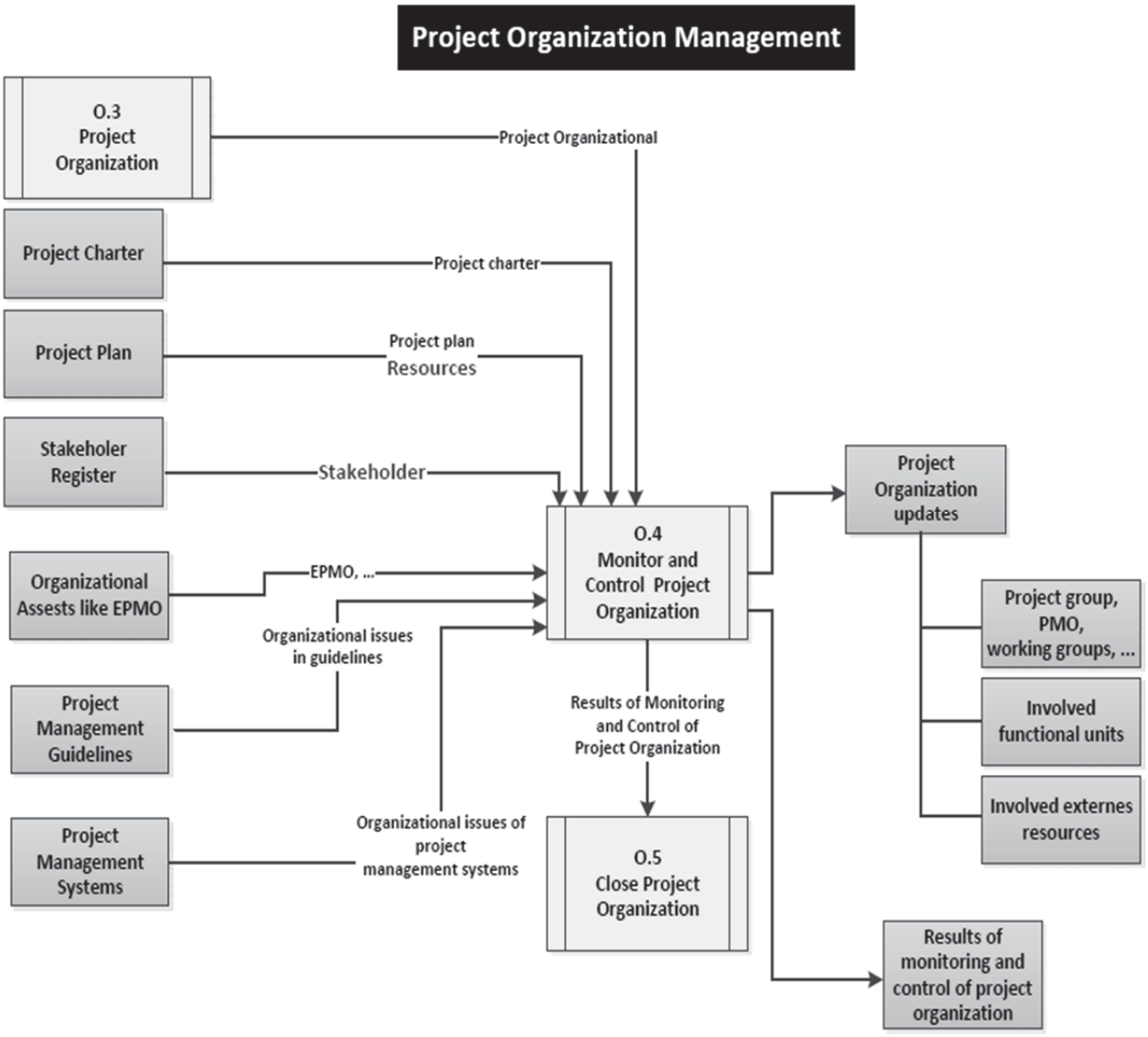

Figure 9: Fourth and fifth Process in Project Organization Management (further developed from Reusch [9], 10])

The last process is assigned to the closing process group and is focused on organizational issues of the project closure. Temporary organizational units must be released, contracts must be closed. Reporting must be finished and lessons learned collected, for example by an enterprise project management office or another permanent organizational unit.

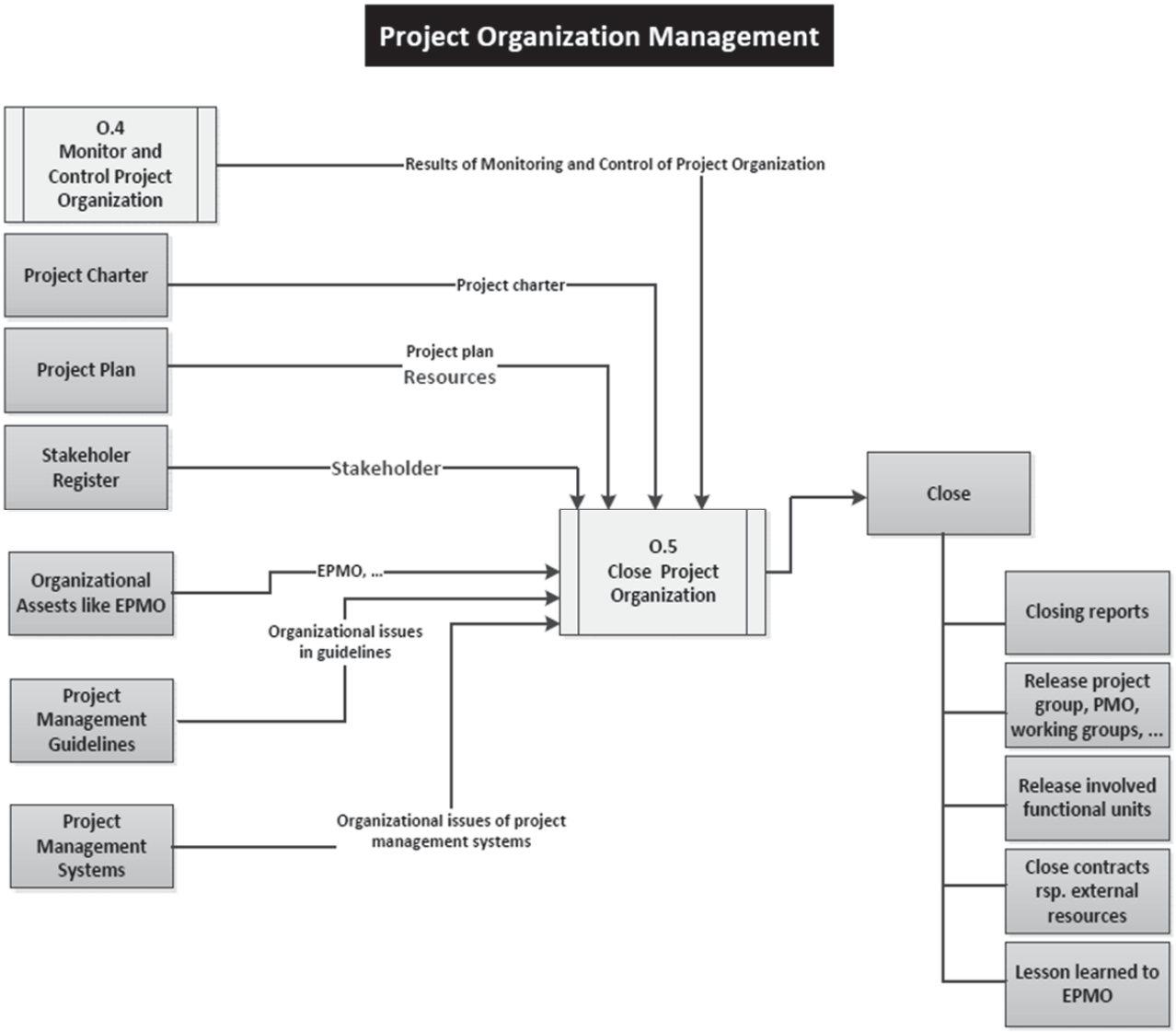

Figure 10: The last Process in Project Organization Management (further developed from Reusch [9], 10])

5. Results and Conclusion

Based on the analysis provided it can be concluded that project organization is an important concept in today's project management, that contributes to sustainable development of an organization. The knowledge area on Project Organization Management with the description of processes, inputs and outputs is a big step towards development of project organization in PMBOK® [7]. This approach for Project Organization Management was discussed with partners in several countries – and discussions continue. Further steps and practical applications are initiated. The approach is also included in a redesign of knowledge fields in project management [13].

6. References

[1] Arvind Rathore, The growing importance of EPMO (Enterprise Project Management Office) in today's organizations, Wipro Technologies, 2010.

[2] DIIR: http://www.diir.de

[3] EFQM - http://www.efqm.org/the-efqm-excellence-model

[4] IPMA OCB - http://ipma.ch/resources/ipma-publications/ipma-ocb/

[5] IPMA OCB 1.0, 2013 International Project Management Association (IPMA®).

[6] Kliem, R. L., 2014. Creative, Efficient, and Effective Project Management. s.l.:CRC Press

[7] PMI, 2013: PMBOK, 5th edition.

[8] Project Management Institute: http://www.pmi.org

[9] Project management for development organizations - http://www.pm4dev.com/resources/free-e-books/doc_download/3-the-project-management-organizational-structures.html

[10] Reusch, Peter J. A.: Extending Project Management Processes and Introducing New Processes for Sustainability, Fourth International Scientific Conference on Project Management in the Baltic Countries - Riga 2015.

[11] Reusch, Peter J. A.: Extending Project Management Processes, Intelligent Data Acquisition and Advanced Computing Systems – IEEE-IDAACS 2015 - Warsaw. http://www.idaacs.net/

[12] Reusch, Peter J. A.: New Standards for Project Audit and the Impact on Existing Standards for Project Management, Intelligent Data Acquisition and Advanced Computing Systems – IEEE-IDAACS 2011 - Prague. http://www.idaacs.net/

[13] Reusch, Peter J. A.: A Redesign of Project Management Knowledge Fields and a Concept for the Implementation, International Research Conference at the University of Applied Sciences and Arts in Dortmund, Dortmund 2015.

[14] Reusch, Peter J. A.: On the Role of Project Organization in Project Management Standards and New Approaches for Project Organization, International Scientific Conference on Project Management IPMA/UPMA - Kiev 2015.

[15] Roland Gareis, Michael Stummer: Processes & Projects, Wien 2008, page 216.

Application of Creativity to the Project Management with a focus on Organizing Process

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Abstract

This paper is dedicated to the review of the ways to boost creativity in the project teams, especially during the organizing phase of the project. The recommendations given in this paper are based on the work of Kliem [5]; as a tool to develop new competency the organisational competency development framework presented in IPMA OCB is recommended. [4]

Key words: *project management, creativity, competency, project phases*

Introduction

Innovation and creativity are being recognized as a source of the competitive advantage that can help business win in the competition in the modern globalized world. One of the ways to do that is to apply creativity tools and techniques to the solution of the every-day business problems. Another observed trend is the shift of the organizations to the project-based model. Businesses convert into projects and apply the most advanced methodologies to run them. To embrace both of these topics, this work is focused on the research of how to bring creativity to the project team.

In the first part of the research we will review, how the matter of innovation and creativity is being addressed in the most popular project management standards. Further we will review the organizational competence development framework recommended by IPMA OCB, to which we will further map the aspects that need to be taken an account, when introducing and fostering creativity in the project team. These considerations will be analyzed with the link to the organizing project phase, described by Kliem. [5]

1. Creativity in Project Management Standards

As the first step of the research we reviewed how the topic of creativity is covered in the most popular project management standards – Project Management Body of Knowledge (PMBOK®) version 5 [10], Project Manager Competency Development (PMCD) Framework Second Edition [9], Prince 2 [7], IPMA Competence Baseline (ICB) version 3.0 [3]. The goal of PMCD is to help develop project management skills and creativity is not mentioned in this source. Prince 2 standard doesn't mention creativity and innovative approaches to the project management as well.

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Project Management Body of Knowledge (PMBOK®)

Creativity is mentioned in PMBOK® in different contexts. Firstly, group creativity techniques are mentioned as a set of techniques, which are “used to generate ideas within a group of stakeholders” to support the project management processes requiring an innovative approach (Collect Requirements) [10]. PMBOK® version 5 mentions the following group creativity tools – brainstorming, nominal group technique, idea/mind mapping, affinity diagram, multicriteria decision analysis. Another context, in which creativity is used in PMBOK® is the one of the interpersonal skills that the project manager should possess in order to be effective decision maker and conflict resolver (Manage Project Team process) [10].

ICB - IPMA Competence Baseline Version 3.0

ICB contains a chapter dedicated to creativity in project management. Per ICB, “creativity is the ability to think and act in original and imaginative ways” and is seen as one of the key factors for the project success. [3] ICB also distinguishes between individual and group creativity. Creativity in this standard is recommended to be applied not only for the problem resolution, but it is also stated that creativity can “motivate the team to work together in developing the creative idea into a workable solution”, in other words serve as one of the means for team building. [3] In addition to that ICB mentions one of the creativity tools – brainstorming, and describes the 8-step process, which can be used to deal with the upcoming problems in a creative manner.

Based on the preformed review of the most popular project management standards it can be concluded, that creativity is not seen as a significant competency of the project manager in some of the reviewed project management standards (PMCD, Prince 2), and creativity tools are not recommended for application by the project managers.

2. Organizational Competency Development

In this section the organizational competence development framework presented in IPMA Organizational Competence Baseline (OCB) will be reviewed, which further will be recommended as a tool to foster creativity competency in organization. [4] This standard addresses the need of the organization to develop competencies not only on the individual, but also on organizational level and shows “the role that an organization has in managing its project, programme and portfolio-related work.” [4] IPMA OCB expands the definition of competency to the group of people and recognizes that in this case the competency is "much more than the collection of competences of its individuals", while it also includes "the coherence of that group with all the dynamic interactions between the members and relevant stakeholders" that make a social system. [4] "The standard defines the organizational competence in managing projects as the ability of organizations to integrate people, resources, processes, structures and cultures in projects, programmes and portfolios within a supporting governance and management system." [4]

The IPMA OCB describes five groups of organizational competencies:

- PP&P Governance: this group of competencies "provides strategic views, policies, guidelines, decisions, monitoring and control of performance as well as directions for the sustainable development of the PP&P competence." [4]
- PP&P Management: this group of competencies "provides people, methods, tools, guidelines, decisions, monitoring and control as well as directions for the sustainable development for all competence elements." [4]
- PP&P Alignment: this group of competencies is designed to address "the goals and expectations for performance set by top management". [4]
- PP&P Resources: this group of competences "provides guidance for defining resource requirements, the acquisition of, and the sustainable development of the PP&P resources." [4]
- PP&P People: this group of competencies "provides guidance for the definition of competence requirements, determination of the current state of competences and the sustainable development of, the PP&P competence." [4]

Per IPMA OCB organizational competence development "is a combination of organizational learning and innovation applied to the existing PP&P strategy, process, structures and culture." [4] When talking about organizational competence development, IPMA OCB emphasizes the role of top management in this process, as besides playing a "crucial role in analyzing the current status quo of organizational competence", it "needs to set directions, provide sufficient resources and involve all necessary parts of the organization (permanent and temporary), and stakeholders". [4] Organizational competence development is seen as a continuous process, which should have "a permanent place in the organization" and needs support on all levels of organization. Therefore it is recommended that organization "assesses the current status of PP&P and formulates goals for the coming" period on regular basis and integrate these goals in the organization's review system. [4]

The approach to the organizational competence development recommended by IMPA OCB please find on the picture below.

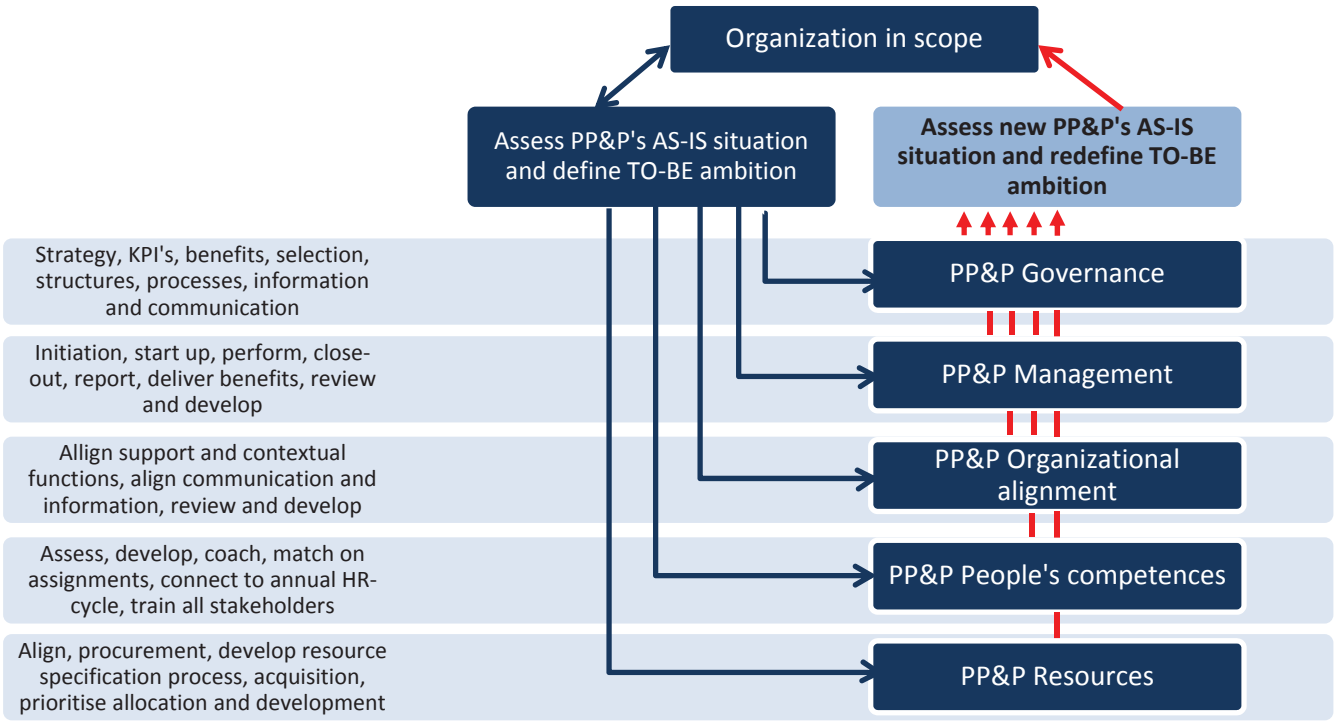

Figure 1. Organizational competence development. [4]

Even though the suggested organizational competence development scheme is focused in first place on the PP&P competences development, it also can be used to develop any other competencies on the organizational level, including creativity.

3. Project Organizing Phase

In this section will be provided an overview of the Organizing Phase of the project presented in the work of Kliem. According to Kliem [5], "the organizing process involves identifying and setting up the infrastructure to effectively and efficiently manage a project. Its focus is on providing a backbone for a project that ensures communication, coordination, and information occurs in a manner enhancing individual and overall performance of a project." [5] This definition of the Organizing Phase refers to the different types of the communications in the project; therefore the further focus will be put on the project communications.

3.1 Organizing Phase vs. PMBOK® process groups

Below is provided a short overview of the project phases described in PMBOK® and the comparison of the project process groups presented in PMBOK® and project phases described in the book of Kliem [5]. Specifically we'll investigate how the Organizing Phase overlaps with the process groups described in the PMBOK®.

PMBOK® identifies the following project process groups:

- Initiation: during this phase new project or phase are defined and the authorization is obtained to proceed with the project or new phase;
- Planning: during this phase the scope of the project is identified, project objectives are refined, and the course of actions that need to be taken to achieve the objectives is identified;
- Executing: the work that needs to be done to satisfy the project specifications is performed in this phase;
- Monitoring and Controlling: the processes that belong to this group "review and regulate the progress and performance of the project";
- Closing: at this phase are executed the activities that are needed to formally close the project or phase. [10]

Based on the overview of the PMBOK® process groups and Organizing Phase presented in Kliem's work [5], the following conclusions can be drawn:

- Kliem [5] talks not only about planning for the project infrastructure during the Organizing Phase, but also includes the setup of this infrastructure. PMBOK® describes initiation process group, which is focused on defining boarders of the project on the higher level and getting the official approval to start the project; project planning process group, during which the project work is planned; and executing process group, during which the actual project work is done, on one hand. On the other hand it doesn't have specific processes or process group, which would be focused on setting up the project infrastructure, which would support the project manager with project planning and further.
- At the description of the Organizing project phase Kliem emphasizes "communication, coordination and information". [5] When looking at the way to integrate Organizing project phase in the current PMBOK® structure, the following considerations arise:
  - It is essential that the project infrastructure is a part of the discussion during the initiation phase and necessary resources are allocated for this purpose.
  - The requirements for the project infrastructure can be derived based on the initial project scope, rough description of the deliverables and stakeholder register, which contains the information regarding the stakeholders, including the requirements for the communication with each (type of the) stakeholder. In other words, after the initiation stage the project manager has enough information to identify the requirements for the infrastructure that is needed to run the project successfully.
  - After the official approval of the project and authorization to use organizational resources during Develop Project Charter process, the project manager has the ability to start setting up the project infrastructure.

- Since the project infrastructure proposed by Kliem is focused on the communications, it will be used to run processes within Project Integration Management, Project Communication Management, Project Human Resource Management, Project Procurement Management, and Project Stakeholder Management. So the work on organizing the project infrastructure could be embedded at least in these Knowledge Areas.

The concept of organizing of the project management infrastructure described by Kliem [5] is not covered in PMBOK® version 5 [10] and therefore can be recommended as an extension to the latter methodology. Based on the considerations above, please find the description of interrelation among Organizing Phase and PMBOK® process groups on the figure below:

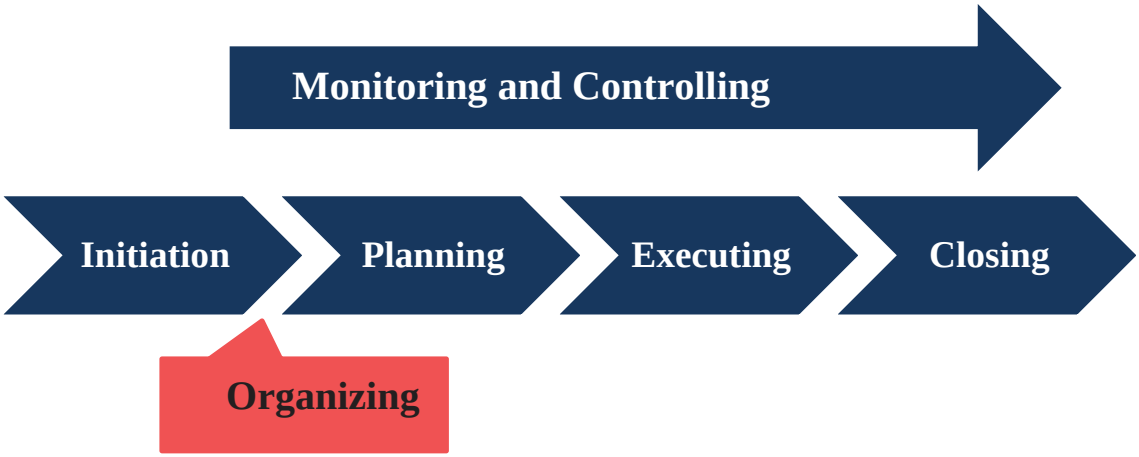

Figure 2. PMBOK® project process groups and organizing project phase. [5], [10]

4. Introduction of Creativity to the Project Teams

This work is focused on the matter of the creativity development in the project team, rather than on tools and techniques, that can be used to help come up with the creative decisions in the work place. The latter topic was discussed in details in our previous work [11]. In this section will be provided the overview of approaches to the development of the creativity in the groups in the broad sense, which can be also applied to the project teams. First of all the organizational settings, that are needed to support creative environment in the project team, will be discussed, followed by the features of the creativity-boosting corporate culture and possible methods to introduce the creativity to the project team, which can be applied by the project manager. During the further review we will not discuss aspects of the top management support of creativity implementation to the project team and organizational alignment.

Different authors use different approaches to give the recommendations on what are the pre-requisites that need to be fulfilled to let the seed of creativity grow in the team. Commonly the outlined recommendations focus on "team task (intrinsically and extrinsically motivating task characteristics); team composition (personality of team members, skill and diversity); organizational context (rewards, learning and development practices, climate); team processes including norms for innovation, leadership, reflexivity, inter-group relations, conflict and dissent) and the likely effectiveness of team innovation." [13] Further we would like to use recommendations on how to foster team creativity suggested by West and Sacramento and as step further see how this approach can be applied by the project manager, with the special focus on the Organizing Phase of the project.

West and Sacramento outline the following recommendations to the organizational settings essential for fostering creativity in the team, that are tuned specifically for teams on one hand, on the other hand – embrace work aspects, outlined above. [13]

- Autonomous work. "The team's task must be a whole task and the team should have an opportunity to work relatively autonomous". [13] While each project is "a temporary endeavor undertaken to create a unique product, service or result" [10], this pre-requisite is a natural trait of a project team, which is formed to fulfill this endeavor. Good project infrastructure can support autonomous work of the project team and therefore support creativity in the team.
- Time for creativity. "The group should be given time during the early stages of the innovation process, in an unpressured environment, to generate creative ideas for new and improved products or ways of working". [13] This pre-requisite can be easily integrated into the planning part of the project.
- Pressure. At later stages of the innovation process, if group members feel pressured, or uncertain, they are more likely to implement innovations, as long as the demands and uncertainties are created by outside of the group (not inside) and the level of demand is not crippling. [13] This setting can be also influenced by the project manager, as he can put additional pressure on the project team by tighter schedules and more challenging tasks.
- Skills development. And the most important recommendation is that "group members must individually and collectively develop the skills to work well as a team, encouraging integrating group processes to ensure that they innovate effectively". [13] This recommendation can be addressed by the project manager as a part of the activities performed in Manage Human Resource area – additional trainings, focused on developing individual and group creativity capabilities, can be offered by the project team members.

Besides general organizational settings, it is important that the culture of the organization has the following traits in order to encourage creativity and innovations:

- Encourages taking risks. It is important that all the team members are involved in the creative process and are properly supported, not only the ones who have the most authority and decision-making power in the organization.

- Encourages information flow through the organization. This aspect refers to multiple factors that might influence information flow in the organization, starting from the physical barriers among the employees at the work place and ending with the company structure, which allows or prevents the information flow among different hierarchical levels of the organization. Since the main goal of the Organizing Phase of the project is to setup proper infrastructure to support effective and efficient project communication, coordination and information, activities performed at this project phase directly support and are critical for building the environment in the project team that allows creativity to exist.
- Supports diversity and flexibility among team members. It is important that diversity is cherished and appreciated in the organization. Following this recommendation would put additional burden on the team manager, while the diversity in the backgrounds and thinking styles of the employees can easily lead to the conflicts within the team and loss of the work efficiency. But, once this issue is addressed, quality of the creative solutions offered by the diverse team will be significantly higher. [1]

All the aspects described above can be handled by the project manager, while besides the responsibility for the actual project work execution the project manager has also the opportunity and should shape the unique culture in the project team and supporting project management infrastructure. In addition to that the project manager has an influence of the selection of the specialists for the project team and therefore can ensure that the selected team members not only have the fitting skills to fulfil the project work, but also project team members have diverse backgrounds. Some of the pre-requisites above require good communication channels within the project team and organization. This aspect can be addressed during the setup of the project infrastructure at Organizing Phase of the project.

Another important component of the creative team is a team leader and his leadership style, while he can be one of the most influential change agents to bring creativity to the team. Coaching leadership style can be recommended in such case as it has strong focus on collaboration with the team mates individually and with the whole team, emphasizes their needs, training, development and motivation. The goal of such approach unlike top-down management approach is “to help the person or group become self-directed in their learning and development.” [2]

Coaching leadership style has the following benefits to the organization based on the poll of 339 HR and personnel specialists in UK. [8]

- “Allows fuller use of individual’s talents/potential 79%
- Demonstrates commitment to individuals and their development 69%
- Higher organizational performance/productivity 69%
- Increased creativity/learning/knowledge 63%
- Intrinsically motivates people 57%
- Facilitates the adoption of a new culture/Management style 39%
- Improves relationships between people/departments 35%.”

The results above show that even though creativity was not the main topic of this poll, 63% of respondents noted that coaching helped to develop creativity and boost learning in the organizations, where this approach was implemented. In addition to that, respondents noted that coaching approach helps employees to apply more their talents (allows fuller use individual's talents/potential) and to lessen the negative effect of the conflicts (improves relationships between people). Both of these things are essential for developing creativity in the team, as it was previously discussed. [1]

When applying coaching style of management, it is important to note, that this type of management requires from manger to spend more time with the team mates, than the traditional management style. This returns us back to the importance of the communications within the project team, specifically between the project manager and the project team members. This task is tightly related with the setup of the project (communications) infrastructure and therefore can and should be addressed during the Organizing Phase of the project.

Another important aspect, that needs to be addressed when developing creativity in the project team – is providing sufficient training for all of the team members on the following topics:

- Creativity tools and techniques should be introduced to all the team members.
- Project manager should be aware of the features of the work environment that boost creativity in the project team.
- In addition to coaching methodology should be presented to the project manager, so that he can support creativity using this methodology during the everyday interaction with the team members.

The recommendations provided above can be built in the IPMA OCB organizational competence development framework as presented in figure 3. In addition to that, the aspects that can be addressed (fully or partially) during the Organizing Phase of the project as it was discussed above are underlined and colored red.

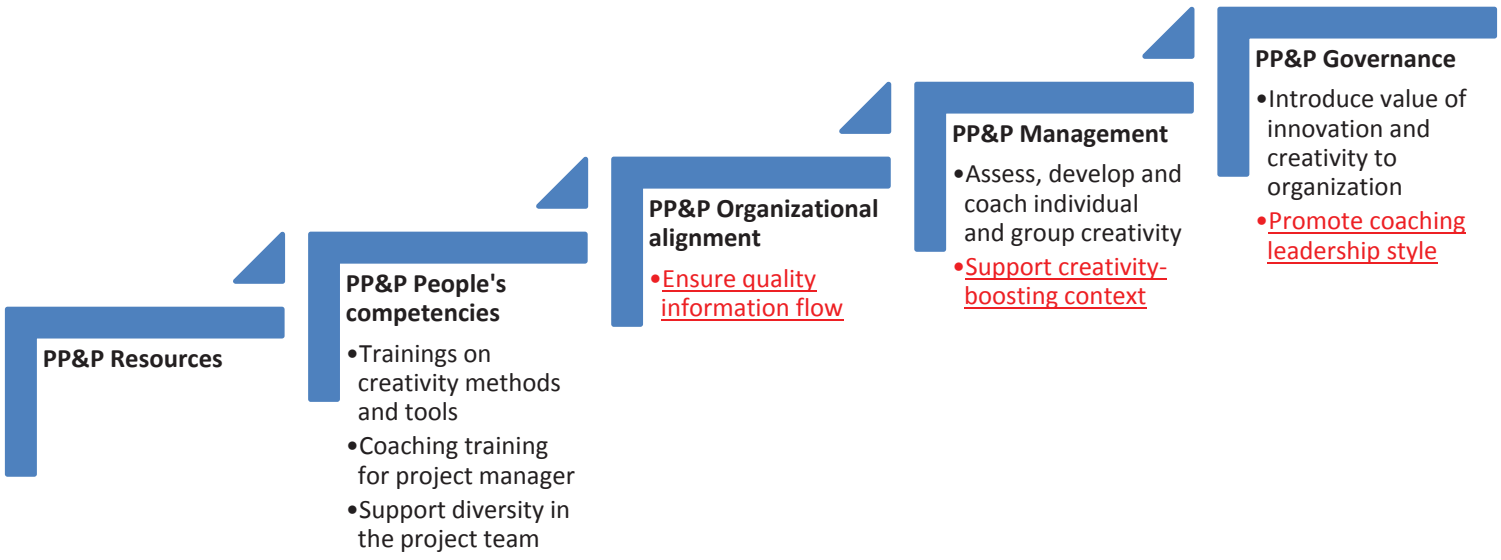

Figure 3. Introduction of creativity to the project team. [Own source]

5. Conclusion

Based on the analysis above were provided recommendations on how to introduce and then support creativity in the project team. All these aspects can be addressed when the development of creativity competency is treated following the organizational competency development process presented IPMA OCB and supported by top management of the organization. Even though top-management support makes it easier to implement this change, if top management is not supportive of this idea, the project manager still can do a lot on his level - choose project team members with the different backgrounds; organize project schedule so that there is a space for creativity, use coaching style of working with the team members, etc.

Another aspect that was reviewed in this work is the importance of building quality project infrastructure not only for the efficient and effective work, but also to support creativity aspect of the project team work. Kliem dedicates a separate project phase for the project infrastructure setup - Organizing Phase. [5] To develop creativity competency of the team, besides such aspects as motivating task, right set of the team members, supporting processes, it is also important to maintain quality communications among team members, between project team and outside world, among the project manager and the team members. All these types of communication are to be addressed during the Organizing Phase of the project per Kliem [5]. Therefore in order to support creativity in the projects per the existing popular project management standards, we would outline the following areas of improvement:

- Focus more on the development on the creativity competency of the project team (individual and group), coaching leadership style development as one of the project manager's competencies, introduction of creativity tools and techniques, support of the creativity in the team through the corresponding culture, procedures, reward system, etc.;
- Introduction of the Organizing Phase of the project to the standard project lifecycle, as the good project infrastructure is one of the important pre-requisites to boost in the project team.

6. Bibliography

[1] Adams, K., 2005. The Sources of Innovation and Creativity. *National Center on Education and the Economy (NCEE).*

[2] Bennett, J. & Bush, M. W., 2009. Coaching in Organizations. *OD PRACTITIONER*, pp. 2-7.

[3] IPMA, 2006. *IPMA Competence Baseline version 3.0.* s.l.:International Project Management Association.

[4] IPMA, 2013. *IPMA Organisational Competence Baseline - The standard for moving organizations forward.* s.l.:s.n.

[5] Kliem, R. L., 2014. *Creative, Efficient, and Effective Project Management.* s.l.:CRC Press.

[6] Morris, W., 2005. *A Survey of Organizational Creativity.* [Online]
Available at: jpb.com [Accessed 02 05 2015].

[7] OGC, 2009. *Managing Successful Projects with PRINCE2.* London: TSO.

[8] Perspective, A. B., 2010. *Benefits of Coaching.* [Online]
Available at: http://www.abetterperspective.com/Benefits_of_Coaching.html
[Accessed 06 05 2015].

[9] PMI, 2007. *Project Managemer Competency Development (PMCD) Framework. Second Edition.*. Philadelphia: s.n.

[10] PMI, 2013. A Guide to the Project Management Body of Knowledge (PMBOK® Guide)—Fifth Edition (ENGLISH). In: *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)—Fifth Edition (ENGLISH).* s.l.:Project Management Institute.

[11] Reusch, Peter J. A. and Zadnepryanets Maria 2015: TRIZ in Project Management- Fourth International Scientific Conference on Project Management in the Baltic Countries 2015 – Riga.

[12] Warner, P. D., 2012. *Creativity and innovation in project management.* Newtown Square, Pa., Project Management Institute.

[13] West, M. A. & Sacramento, C. A., 2006. Flourishing in Teams: Developing Creativity and Innovation. pp. 25-44.

SUBSTANTIATION OF USING IPMA OCB AS A BASIS FOR OPERATION AND DEVELOPMENT OF COMPANIES

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Keywords: organizational development, turbulent context, IPMA OCB

Abstract: External environment becomes more and more turbulent. When old tried and tested mechanisms can no longer guarantee the achievement of the goals, there is a need in a new paradigm. Proactivity and flexibility of companies become the main factors for success of projects and programs. Competence-based approach in the development of the company could be the answer to the challenges of the environment. The work aims to provide proofs for choosing Competence-based approach approach.

1. Introduction

External environment becomes more and more turbulent and dynamic for international and Ukrainian business. Old tried and tested organizational structures, processes and paradigms of thinking, nowadays cannot always adequately meet the challenges of the market. Increasing risks and permanent changes require new competencies and mechanisms for project management, both from employees and from organizations. In fact, even highly skilled staff is obliged to carry out its activities within the framework of policies and strategies of their companies.

2. Substantiation

The evolution of organization becomes issue of survival, which requires continuous sustainable development and self-learning, adequately to context. The focus of competence should displace from "hard" technical skills to the side of "soft" contextual and interdisciplinary skills. "Soft" skills - unified skills and personal qualities that increase the operational efficiency and interaction with other people. These skills include: management of personal development, the ability to provide first aid, the ability to competently manage own time, ability to persuade, negotiation skills, leadership, etc. “Hard” skills - skills is related to the technique of execution, which can

be clearly demonstrated. These are unique skills, inherent in a certain category of professions. The employee who is trained in skills in this category is able to bring the action to automatism, acting on a pre-familiar pattern.
Triggering mechanism of such changes could be the elaboration of organizational competencies in project management, based on the model of IPMA OCB.
Competence approach permeates the entire company - strategy, project management methodology, project team members. Especially true for Ukraine was and remains the issue of qualified personnel, able to accept and follow modern models. It is obvious, that the more complex internal and external context of the project is, the more qualified companies and personnel required for its implementation. However, modern managerial skills should not be in the technical skills, as it is now.
According to IPMA Competence Baseline, in addition to technical and behavioral competences of project managers, there is a section of the contextual competence. According to the rules of certification, during the Project Manager's career from Level D to Level A, weighting factor of technical competencies is reduced from 70% to 40%, but the behavioral and contextual contrary increased from 15 to 30% each. This is what the Project Manager has to show on the certification.
Similar trends are expected from the organization's competencies in project management for the operating work and further improvement of the projects, programs and portfolios management.

3. Results and Conclusion

IPMA OCB describes how to carry out the analysis, assessment and development of project management. The challenges of the market determine the competencies of the company, and only then internal processes are to be formed. Just such a philosophy would allow to be flexible and responsive to the challenges of the external environment, preserving and developing staff, reconfiguring the processes according to the requirements, and not vice versa.

4. References

[1] Bushuyev Sergey D., Wagner Reinhard F. IPMA Delta and IPMA Organisational Competence Baseline (OCB): New approaches in the field of project management maturity, International Journal of Managing Projects in Business, Vol. 7, 2014

[2] IPMA Organisational Competence Baseline (IPMA OCB). IPMA, 2013, 67 p.

[3] Kerzner H. In search of excellence in Project Management. VNB, 1998. 274 p.

[4] Bushuyev S.D., Bushuyeva N.S. National Competence BaselineNCB UA –3.1. Kiev: IRIDIUM, 2010, -208p. In Russian.

EXPOSITION OF THE PROBLEM OF CREATION A PART - TIME EMPLOYMENT CENTER FOR UNIVERSITY STUDENTS IN KIEV

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The article describes the problem of providing students with jobs. The main content of the study is an analysis of the students' attitude to the idea of creation a part - time employment center. In conclusion, the group of main stakeholders is determined.

Key words: students, part – time employment, analysis, center, Kiev.

1. Introduction

Today the problem of earning money is particularly acute. People of working age can't implement nor their ideas neither find a well-paid job, can't develop themselves as personalities and can't build a normal family. We always have to look for part-time jobs and not live but survive in this world.

Students are one of the most vulnerable jobseekers. The difficulties of student employment are clear: lack of professional experience, breaks associated with educational sessions. Moreover, if students with evening form of studies in the context of the labor market can be roughly equated to applicants of the money with incomplete higher education, the full – time students have to choose between part-time works and work with the free schedule [1].

Student, interested in underworking in period of studies, spends a lot of time searching for the work, observing sites on the Internet, sending resumes, attending fairs of vacancies and career days, communicating with recruiting organizations, press and participating in various competitions. According to statistics, the average duration of such a search is 5-6 hours per week. The main directions of underworking among students are distribution of promotional items and cards (21% working students), 19% are couriers. Porters, vendors or promoters in supermarkets - 17%, and 12% of students work part time in fast foods and interview passers-by. 11% work as waiters in cafes and bars, 9% - are tutors, 8% - are engaged in computer programming, 4% - are interpreters, 3% - are freelancers, 2% - look after patients and work as nannies, and finally, the smallest number of students - only 1% - are involved in the construction [2].

The need for combining work and study are in contradiction, because the work can harm the learning process. The student must have time to actively participate in learning process, work, have rest and evolve as a person. The workload leads to skipping the lessons and a rapid reduction of the student's competency.

To solve the problem of partial employment of students during their studies at the university, it was decided to develop a project of creation a special part-time employment center for students, which will help to reduce the time that is spent on job search, raise incomes and create favorable conditions for learning and self-development of students.

2. The aim of the paperwork

This paperwork is determined to analyze the interest of students in a project realization and their attitude to the idea of creation a part – time employment center.

3. Main results

It is not a secret that to survive on scholarship of students, studying at educational levels (OCD) "bachelor", "specialist" or "master", which is 730 UAH, almost unreal. This - 2/3 of subsistence level (which is from 1 January 1176 is UAH)

The first stage of the research is the calculation of average earnings and expenses of students (table 1) for detecting the amount of money required for a normal life support of metropolitan students. Number of surveyed students is 100 people of Kiev Universities.

Table 1 – Average monthly income and expenses of the student

Income article	Total income (UAH)	Expense article	Total expenses (UAH)
Scholarship	731	Dormitory	350
Help from parents	500	Products	900
Earnings	80	Passage	90
–		Recreation	200
Total	1311		1540

From the table above (table 1), we can conclude that the average student expenses exceed his income on 229 UAH, what is about 30% of the scholarship. In

addition, into the table were not included unexpectable expenses, such as costs of medicines, clothing or expenses arising upon the occurrence of a force majeure situation.

At the second stage the survey was conducted to collect primary data on the base of which the interest of the students in project realization is illustrated (Fig. 1).

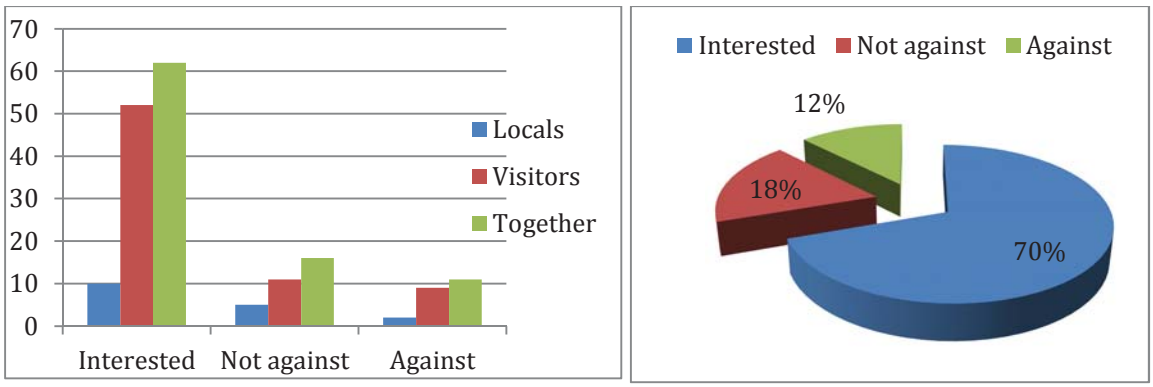

Figure 1 – Diagram of interest of students in project implementation

Results of the survey: the number of interested in project students constitute 61%, from which local students – 14.6%, and visitors – 46.3%. Students, who were not against the creation of such a center constitute 27%, local students – 9.8%, visitors – 17.1. Against the project are 12% of the students, 2.4% of them are local and 9.6% of visitors.

As for areas of possible employment, respondents showed interest in working in any direction from the cleaners, couriers, service personnel to better paying jobs as text editing, photo sessions, tutoring.

Thus, the results of the survey confirm the interest of the consumer - students in the project "Creation of part - time employment center for university students in Kiev". In addition, the initial range of stakeholders of this project should be identified: customers, investors, customers, the community. It is necessary to identify the needs and values of each of the stakeholders.

According to a preliminary analysis stakeholders are:

1. Customer. An organization that is interested in the project.

2. Investors. Physical or legal entity that invests in the development and implementation of the project.

3. Consumers. The receiver of product project.

4. Community. Feels changes due to the project.

The initial vision of stakeholders: it is a customer, who will be presented, by one of the Kyiv universities, on the base of which, the center will be created. In addition, students of this university will be able to be involved in the work of the center. Investors are groups of entrepreneurs, the benefits of which will consist in providing the necessary personnel to their businesses. The consumers are students who will be able to get a job quickly, on time, according to their time constraints and gain experience in different areas according to their own needs with the help of part – time employment center. The community will feel reduction of social tension among students.

4. Conclusion

The product – is the part-time employment center for university students in Kyiv, based on the university. The product will give students higher earnings and opportunity to realize their potential, will help to improved financial security and adequate supply for entrepreneurs with unskilled personnel.

References

[1] Planetahr, http://planetahr.ru/publication/1516, Career start, 2015

[2] Censor, http://censor.net.ua/resonance/220690/, Working routine of the Ukrainian youth, 2012

E-Government in Palestine – Introducing the Government-to-Government Data Exchange Layer

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Keywords: e-Government, G2G, Data Exchange Layer, Palestine

Abstract

The rise of the information society led to major changes in citizens' expectations and organizational structures, cultures and working processes. Governments will have to adopt information society tools and working practices in order to remain responsive to citizen needs. In countries with political instability, physical barriers and a large extent of citizens in diaspora, such as Palestine, e-Government solutions become a necessity in order to connect and serve citizens inside Palestine from different cities, remote villages and rural areas despite the political barriers and to address the needs of Palestinian refugees around the world. Such solutions can help improve the life of citizens, achieve higher citizen engagement in decision making and increase effectiveness and transparency in public sector. This paper will present an overview of the project to implement an interoperability solution; a G2G data exchange layer, in Palestine with support of the Estonian government. The author of this paper was a consultant at the Ministry of Telecom and IT in Palestine and was assigned as the project manager of this project until the project was closed and handed over.

1. Concept of E-Government

OECD (2003) defined e-Government as the "use of information and communication technologies, and particularly the Internet, as a tool to achieve better government", while Gil-Garcia and Luna-Reyes (2003) define e-Government more broadly as the "the use of information and communication technologies in government to provide public services to improve managerial effectiveness and to promote democratic values and mechanisms; as well as a regulatory framework that facilitates information intensive initiatives and fosters the knowledge society". However, the term can have many different definitions reflecting the priorities of the government setting this definition, as follows:

- e-Government represents online service delivery and other internet-based activities such as e-consultation.
- e-Government is equated to the use of ICTs in government. While the focus is generally on the delivery of services and processing, the broadest definition encompasses aspects of government activity.
- e-Government is defined as a capacity to transform public administration through the use of ICTs or indeed is used to describe a new form of government built around ICTs. (OECD, 2003)

2. E-Government in Palestine

e-Government concept was first officially introduced in Palestine by the Ministry of Telecommunications and Information Technology (hereafter as MTIT) in 2005 and it was immediately integrated into the overall ministerial strategy. On a national level, a ministerial committee was formed, with representation of six different ministries whose data is considered a baseline for public services. This ministerial committee was directly under the supervision of the Prime Minister's Office and headed by the Minister of Telecom and IT. In 2009, the first e-

Government department was set up in MTIT with its own vision, strategy and roadmap. Three years later, in cooperation with the OECD, the Palestinian government set a nation-wide e-Government Implementation Roadmap. Since then, most public sector organisations set up their own e-Government departments, in coordination with MTIT and corresponding to the national roadmap of 2012. (MTIT, 2014)

E-Government in Palestine is composed of five frameworks:

1. Policy framework: it includes the strategy and guiding principles for the e-Government. The main principle is to "provide a better life for citizens by being a Government that empowers citizens to participate in government; connects citizens, the private sector and institutions to drive economic growth and meet community challenges and delivers real public value through citizen-centric government services". The policies set define the relevant business and governance principles of working in team, working to re-engineer the government, ensure privacy, transparency and accountability and focus on continuous improvement. Finally it also defined the ICT principles such as leverage open standards and software, ensuring scalability and security and ensuring low cost of ownership. (Ministerial Committee for e-Government, 2005)

2. Legal framework: the legal framework is concerned with legislation that needs to be prepared in parallel and coordination with the technological development in order to ensure privacy, security, transparency and accountability and to take preventative and reactive measures in case of breach of any of the aforementioned principles.
MTIT acts as the main regulator in the ICT field. In 2009, telecommunications regulatory authority has been established. The legal framework of this sector is defined by Telecommunications Law 3/1996 and by regulatory provisions under the Oslo Agreement (World Bank, 2008). There have been several drafts and readings for laws related to ICT or others that would eventually affect the ICT sector, in general, and e-Government, in particular, such as Competition Law (the latest in 2012) and E-Transactions Law (latest in 2015) (Abed Rabbou, 2015). Given the fact that the Parliament in Palestine is not in regular sessions for many years already, the regular legislative process is not possible. Therefore, legal issues can for now be in the form of decrees adopted under the system applied in Palestine or in other forms, pending a resumption of normal legislative activities (Abed Rabbou, 2015) (Metcalf-Neyman, 2014). Until the writing of this paper (March 2015), e-Government in Palestine was relying and working to create/improve following legislation:

- Issued: ICT Law
- Drafted / In Reading: E-transactions law and Cybercrime (as provisions to Criminal Law)
- To be drafted: Legislation on Right to Access Information, Intellectual Property Protection Legislation, Personal Data Protection Law, etc.

(Birzeit University, 2014) (MTIT, 2014) (Metcalf-Neyman, 2014) (Abed Rabbou, 2015)

3. Interoperability framework: the interoperability framework deals with semantic, organisational and technical interoperability. The technical interoperability will be discussed in Section 4 of this paper. As for the semantic & organizational interoperability, it is an ontology-based data and process governance framework, consisting of the agreed-upon: vocabulary (naming), meaning, structure, business rules pertaining to the data exchanged in e-Government services and business process standardization. It was developed by the Palestinian National Interoperability and Standardization Team, which includes representatives of public sector organisations, private sector and a few Palestinian universities. (MTIT, 2014) (Zinnar, 2014)

4. Security framework: the security framework is regulated by the "Information Security policy" document created by the e-Government department in 2009 and updated in 2012 (MTIT, 2014). Furthermore, a "Computer Incident Response Team (CERT)" was officially adopted in 2015,

with the tasks of defining security and data protection standards and to create and track possible incident, problematic scenarios and emergency responses. The interoperability solution that would be through the project discusses in Section 4 also had security components based on PKIs and provides access control on service/institution level. (MTIT, 2014) (MTIT, 2015)

5. Infrastructure framework: Along with defining requirements, standards and supporting the procurement and installation of the hardware components in primary and secondary locations in Palestine and hardware related to individual public sector organisations, the infrastructure framework governs the particularities of the "GovNet", the governmental intranet, which is based on high-speed, secure, leased network using fibre optics and currently connects over 85 governmental agencies and their respective branches (over 420). (MTIT, 2014)

3. E-Government Interoperability Solution in Estonia

Estonia is one of the leading countries in e-Governance in Europe and the world. For more than 15 years, several e-Government solutions were developed, adopted by the government and exported to different countries in the world. The interoperability solution that would be later introduced in Palestine, is a data exchange layer developed by private sector then officially adopted by the government, to connect public sector, private sector and citizens. It is composed of several components, mainly a certification authority, a web service development/ consumption component, security & monitoring components and a state portal that provides users (citizens, enterprises, public sector staff, etc.) an interface/access to services. It has been under use for 14 years. (e-Governance Academy, 2015)

Some sample services offered through the Estonian e-Government interoperability solution (numbers last updated on 26.02.2015):

- Medical recipes – 90% online
- Tax declarations – 97% online
- Digital signatures – 201 Million
- Court cases management – full life cycle from investigation to imprisonment with authenticated access
- Online elections 2015 – estimation: more than 20% of all votes

(e-Governance Academy, 2015)

4. Implementation of e-Government Interoperability Solution in Palestine

The eGovernance Academy (eGA) in Estonia and the Palestinian Ministry of Telecom and IT initiated a project to implement an e-Government Interoperability Solution in Palestine. The project was financed by the Estonian government, represented by the Estonian Ministry of Economy and Communication.

The project's goal was the implementation of a Palestinian inter-ministerial data exchange layer for the purpose of ensuring secure, easy and efficient data exchange between governmental information systems. The project was planned with an estimated duration of one year. This was only made possible because of the previous work done by Palestinian and Estonian teams over the past four years to create standards and adapt the interoperability solution to Palestinian needs.

The project was planned to start in 01.01.2014 and end in 31.12.2014. However, the ending date had to be postponed due to external factors. The purchased hardware components had to be imported and were held for about 10 weeks at the borders by the Israeli authorities (6 weeks more than the buffer planned for such a delay). Also, the major steps of project implementation were planned during the summer. But the summer of 2014 is when the political situation

deteriorated and the third war on Gaza started. This made movement between cities difficult, even in the West Bank, and made it very complicated for the trainers to arrive from Estonia. Despite all that, effort by the participating teams intensified and the project was successfully closed on 26.02.2015.

As there is no legislation in Palestine defining the "Right to Access Data", the participation of public sector organisations and the exchange of data between them were on voluntary basis and a number of Palestinian public sector organisations (around 10) expressed interest in joining the project. For a public sector organization to join, it had to define a list of e-services that it is willing to provide or is interested to consume or both. It also had to provide the necessary hardware components to be connected to the system and to ensure the availability of its technical staff during project trainings.
Based on these discussions, a list of e-services to be developed during the project was defined. The e-service description included metadata and listed the public sector organisations consuming this service. Based on that, the scope of the project in terms of the number of e-services and the number of participating public sector organisations was defined.

The project focused therefore on three outcomes:
1, Technological outcome: this included hardware and software components. The outcome here would be the installation of the necessary hardware components for security and certification and for running the system in the central location and at each public sector organisation involved. As for the software, the goal was to provide the license and necessary software components, again for data exchange, security, monitoring and certification.

2. Organisational outcome: this included setting up Palestinian national teams specialized in each component of the system. The goal here was to ensure sustainability of the previous outcome. It was obligatory to provide the Palestinian staff with the initial skills to run the system and develop and consume e-services. This would enable them to further extend the outreach of the system to more governmental organisations, further develop e-services, create their own training material and courses about the system and set up the organizational structure, business processes, legal processes and security standards related to the interoperability solution.

3. Sample e-services: as mentioned above, before the first round of staff training took place, target e-services were defined and described. During the first training, Palestinian system administrators from each participating public sector organisation with the help of Estonian trainers installed hardware, software and security components and developers wrote code to provide/consume the relevant e-services. A testing period was allowed to track issues and cumulate feedback then the second phase of training started. This step was repeated once again until the required exchange of skills had been achieved and the target sample e-services were being exchanged. Some of these services include: citizen registry data, company registry data, data on beneficiaries of social insurance, notification of birth and of death and civil servant data.

5. Further Research

The implementation of the interoperability solution in Palestine with the support of a European partner is an interesting case to observe. It also raises a lot of questions about projects in the public sector, such as the role of the private sector, the centralization or decentralization of administration for IT solutions used on a national level, the choice of project managers in such projects in terms of employing short-term external staff who would dedicate their time to the project, or assigning a staff member who might be better informed and experienced but might find difficulty dedicating all their time to project tasks. Issues such as security, system

downtime and cyber-attacks, especially in an area of political instability are also a challenge that needs to be addressed.
A further analysis of this case in different post-project time intervals to evaluate the project outcomes and its sustainability and to collect lessons learnt would further enrich the experience.

6. References

Abed Rabbou, J. (20. January 2015). Legal Advisor - Ministry of Telecom and IT. (A. Nuseibah, Interviewer)

Birzeit University. (November 2014). Presentation on the Analysis of the e-Government Legal Framework in Palestine. Training on e-Government Legal Framework. Ramallah: Institute of Law - Birzeit University.

e-Governance Academy. (26. Februar 2015). Presentation on Governmental Interoperability Implementation. Closing Ceremony of Project for the Implementation of Interoperability Solution in Palestine. Ramallah.

Metcalf-Neyman, K. (2014). Palestine eGovernance Legal Issues. Tallinn: eGovernance Academy.

Ministerial Committee for e-Government. (2005). e-Government Strategic Plan. Ramallah: Ministry of Telecom and IT - Palestinian National Authority.

MTIT. (2014). e-Government Legal Framework (Arabic Webpage). Retrieved from Ministry of Telecom and IT - Palestine: www.mtit.ps

MTIT. (2014). e-Government Roadmap. Retrieved from Ministry of Telecom and IT - Palestine: www.mtit.ps

MTIT. (March 2015). News (Webpage in Arabic). Retrieved from Ministry of Telecom and IT - Palestine: www.mtit.ps

OECD. (2003). The e-Government Imperative. Paris: OECD Publishing.

World Bank. (2008). Introducing Competition in the Palestinian Telecommunications Sector. West Bank & Gaza: World Bank.

Zinnar. (2014). Interoperability in Palestine. Retrieved from Palestinian Interoperability and Standardization Team Zinnar: www.zinnar.ps

MODEL OF INTEGRATED MANAGEMENT BY PROJECT WORKS SEQUENCE BASED ON DELIVERABLES DISTRIBUTION

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Key words: integrated management model, deliverables distribution, project works sequence, "critical field" project actions.

Introduction

Enterprises of the Ukrainian energy sector begin the radical reengineering based on innovative projects, in line with the global trend of continuous improvement activities [2, 10, 12]. With these reasons, development of the innovative projects performing models with regards to reengineering the business processes and energy supply for consumers is very important. As the performance indicators of these projects are used consumer reviews and minimizing investment risk which weigh more than sales volume and companies profits.

Innovative projects have inherently the probabilistic nature of results because of their novelty, and it's aimed to ensure the product design according to stakeholder's requests. It complicates the objectives of project management work on the structure, resources and assessment need under the time and cost of the project as well as project quality [5].

The novelty of the innovation project works usually leads to reworks in project executing, increasing the man-hours capacity towards the certain one in initiation stage [6]. In parallel duration of the project execution is rising compared with the predicted one, that is a number of predicted results distributions as well as actual ones are presented during the performance of works sequences.

Thus existing methods and approaches, e.g. PERT underestimates the real danger of the successful project implementation [10], which can be caused by those distributions above and lead to a loss of goal achieve. The reason for this is following: if the works deliverables distributions of the project are presenting then there is no unique critical path, hence the PERT approach does not bring the result [9, 11].

Therefore, Tytsyak (2014) proposed to change the paradigm on "unique critical path" to take into account the uncertainty, and he suggests the term "critical field" instead the previous one: "the various implementation within the current process leads to various changes in the critical path, one event is uncertain at the end of the project could change the entire critical path, also in the very beginning of the project".

Adoption to uncertainty in the project, in most cases determines the consequences for the whole process of manage, direct, monitor and control. The outputs of such process are always strongly connected with its other actions; as a result it makes a problem for modeling the project management [7].

1. Proposed Model

As mentioned above, the results of the project have certain distributions, creating paths fields which are used for project objectives. Analyzing the project in retrospect, we see that project works can be considered as an interconnected sequence in the "critical field" to reach a target of the project state (Figure 1).

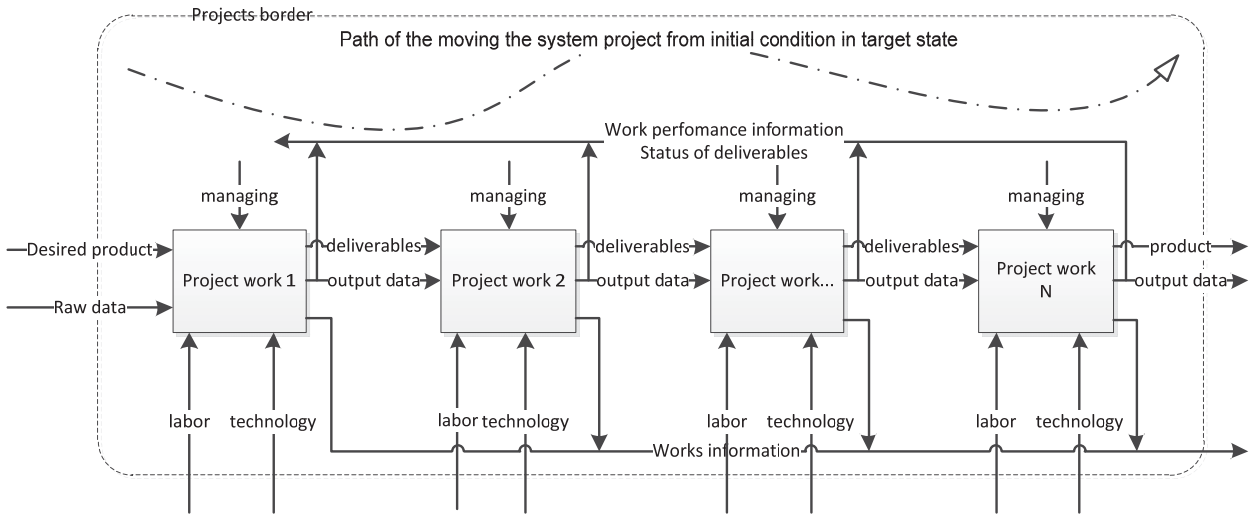

Fig. 1. Diagram of the interconnected sequence project works with outputs.

Diagram shows that the sequence works are formed from separate components - works, combining the output of previous work includes the following results of project product development. Each work generates data, in particular the results of product developing and progress. These data are a base for forming the information model of managing resources for project works performing. Information assessment of the situation for the dynamic state of management object towards targeted domain of trajectory position in the phase space of the project is used to form approval procedures of targeted decisions making.

At the core of decision-making on project management is monitoring the balance performance parameters [6], which contain information oriented images of model control parameters (Figure 2) to address project management process modeling [3, 8].

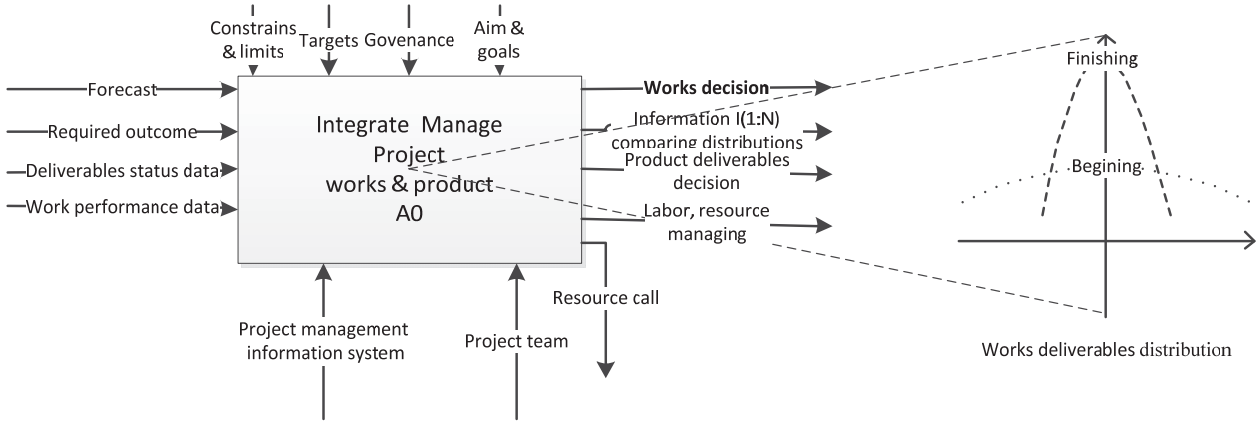

Fig 2. General model of managing the project works sequence and product with deliverables distribution

Decomposition model presented in Figure 2 allows synthesizing the structure of the system of integrated management and monitoring project works performing. This synthesis information component control (feedback) built by the objectives in the hierarchy of management work performance project that is integrated with controlling project product development [1], the assets of the organization processes are used as a mechanism for integrated management of the project. The resulting decomposition model (Figure 3) includes management processes design and execution of works iterations action on projects product development. The given model complies with the provisions PMBOK, integration management of the project, covering decisions regarding allocation of resources, search for compromises between conflicting objectives and alternatives [1].

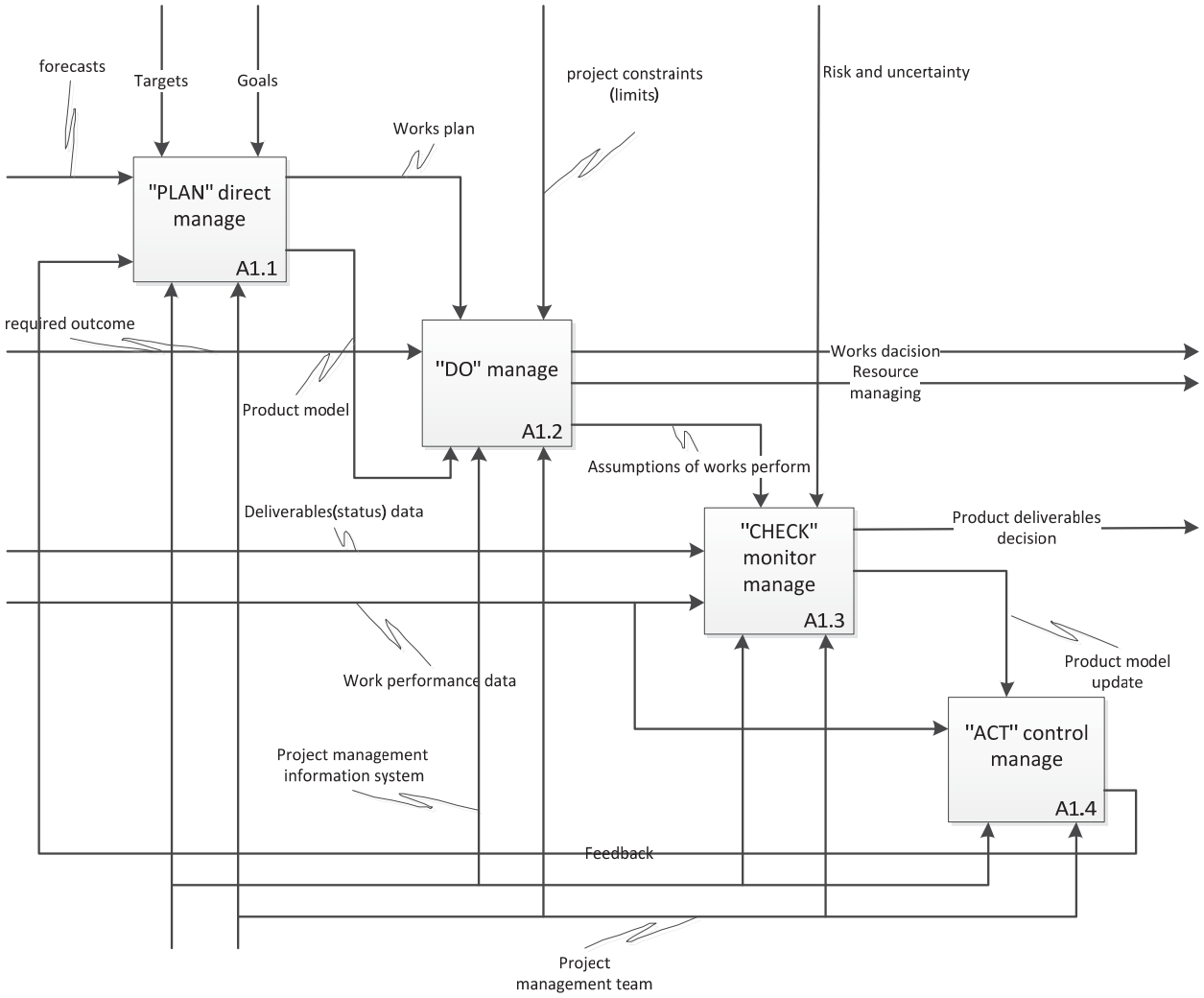

Fig. 3. Decomposition model of integrated management according IDEF0 notation

The advantage of the model (see Figure 3) is reflecting the intersection and interaction of project management processes - as discrete elements with certain limits which are specified up to the required level of the control. This method ensures the quality control (Deming wheel “PDCA”) with the priori given size distribution. This result is confirmed by implementation in practice of innovative projects for electricity supply corporation "Khmelnytskoblenergo" (Ukraine).

2. Conclusions

To achieve the project goal authors developed the managing model of mutually related sequences works in project actions "critical field", which reflects the data groups forming the information part of the object dynamic state regarding manage of resources for project works performing. Monitoring the balance of work performing and product developing is a core of project management decision-making. In such way a drawback by the final state control is eliminated, while we can affect on the next step of the project management actions only.

Proposed approach enables to synthesize the structure of the project works manage and monitoring system. As a result a synthesis of the information component control (feedback) can be run on the base of the tasks in the hierarchy of the project management works. Those tasks contain the information oriented images of model control parameters.

One of the perspective directions of future research is the synthesis of a model for managing the project information recourses. Such model can be a base for developing the integrated model for managing the programs and projects.

3. References

1. PMI (ed.): A guide to the project management body of knowledge, (PMBOK® Guide) – Fifth Edition PMI 2013.

2. Aschoff, Tobias, 2013: Tailoring of company internal project management standards for power plant projects, Proceedings of the International Research Conference at the University of Applied Sciences and Arts in Dortmund.

3. Browning, T. R., 2001: Applying the design structure matrix to system decomposition and integration problems: a review and new directions, Engineering Management, IEEE Transactions on, 48(3).

4. Clark, K. B.; Fujimoto, T.; 1987: Product development. World Auto Industry: Strategy, Organization and Performance, Brookings Paipers on Economic Activity, 3:1987.

5. Clark, Kim B., 1989: Project Scope and Project Performance: The Effect of Parts Strategy and Supplier Involvement on Product Development, Management Science, Vol. 35, No. 10 (Oct., 1989).

6. Dombrowski Z.; Sachenko O.; Dombrovskyi M.; Rymar O., 2013: Model of Project Management Based on System Approach, The 7th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications. 12-14 September 2013, Berlin, Germany

7. Gemino, A.; Reich, B. H.; Sauer, C.; 2007: A temporal model of information technology project performance, Journal of Management Information Systems, 24(3).

8. Reich, B. H.; Gemino, A.; Sauer, C.; 2008: Modeling the knowledge perspective of IT projects, Project Management Journal, 39(S1).

9. Rogers, J. L., 1996: DEMAID/GA—An Enhanced Design Manager's Aid for Intelligent Decomposition (Genetic Algorithms), Proceedings of the Sixth AIAA/USAF/NASA/ISSMO Symposium on Multidisciplinary Analysis and Optimization.

10. Schneider, J., 2013: Management of Organizational Change Projects in the German Energy Sector, Proceedings of the International Research Conference at the University of Applied Sciences and Arts in Dortmund.

11. Tysiak, W. (2014). A Deeper Insight In Some Effects In Project Risk Management. International Journal of Computing, 13(4).

12. Wetekamp, W., 2013: Investment Projects in the Energy Sector - Bottleneck Financial Sources, Proceedings of the International Research Conference at the University of Applied Sciences and Arts in Dortmund.

Smart Biogas Power Plants

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Abstract: *Regional bioenergy systems are a promising approach for sustainable energy production and consumption [2]. The value chain remains in the local context and the socio-economic environment is stimulated by the close interaction of the relevant players. Nevertheless, in such small systems it is crucial to balance supply and demand, especially if it is based on fluctuating sources like solar power, wind and bioenergy. Biogas power plants can form a backbone for such systems since they can provide both heat and electricity [3,10]. Furthermore, they can provide energy on demand to some extent since they can store the biogas. To fulfil this role, biogas power plants need to be flexible, controllable and fast in reaction to demand changes. They need to be "smart biogas power plants". Today, biogas power plants are good in providing a stable base load of electricity. Nevertheless, they cause one of the highest production costs for renewable electrical energy and they waste the heat since they cannot provide it in time and in place to the customers. To transform biogas power plants into valuable core components of future regional bioenergy systems, a whole set of modifications is required. Engineering has to develop flexible components for biogas power plants both for gas production and energy conversion. This provides subsystems with a sufficient degree of freedom (DoF). Adding a distributed control architecture makes these subsystems cooperating and controllable. With an intelligent plan and decision instance on top, the overall system can be integrated into a regional bioenergy system. This contribution describes the requirements and challenges for smart biogas power plants, two examples for components and the process to develop a smart component.*

Keywords: renewable energy systems, biogas power plant, smartification process, smart grid, smart heating grid

1. Introduction

Due to the establishment of the renewable energy act (EEG) [9] in Germany, biogas became a significant source of renewable energy in Germany. By 2014, 8.000 biogas power plants were producing mainly electricity, heat (if a heat demand is available close by) and in some cases gas. The electricity production capacity is comparable to two large nuclear power plants. Electricity production from biogas power plants is reliable and can be used as base load in a smart electricity grid. Apart from electricity, the block heat and power plant (BHKW) of a biogas power plant produces heat. The amount of heating energy is similar to the amount of electrical energy, but most biogas power plants treat heat as waste energy. This is due to the fact that biogas power plants are installed in remote rural places to guarantee short distances for the transport of biomass to the plant. Furthermore, after the digestion process of the biomass within the fermenters of the biogas power plant, a substrate remains that is used as fertilizer for farm land. The remote location of the biogas production site reduces the options for heat usage. The problem can be overcome, if the block heat and power plant is not installed at the biogas production site but e.g. in a residential or industrial area and connected to the biogas production with a gas pipeline (so called micro-gas-grid). Nevertheless, this is not possible or was not done

for many biogas power plants. As a result, only electricity is sold and this electricity is amongst the most expensive sources of renewable energy. In future, biogas power plants need to be adapted to become a valuable part of the renewable energy system:

- A biogas power plant needs to re-focus its electricity generation to provide peak load and flexible load to the grid. This requires fast changes in electricity production. To some extend this is possible since biogas can be stored (today already for ~1 day) onsite at the biogas power plant. This is currently the main focus for making biogas power plants flexible. Nevertheless, flexible changes in gas production are an important requirement, too.
- A biogas power plant should become more flexible towards fluctuating demand in both electricity and heating. Apart from smart grid, a smart heating grid has to be considered in future, too. Heat can be stored to some extent. Therefore, demand profiles for heat and electricity (and for maintenance) need to be balanced by smart (e.g. self-optimizing) decision making systems.
- It is necessary to add means for shifting heating energy into additional electricity and vice versa, e.g. by adding additional systems for heat-to-electricity conversion.
- The anaerobic digestion process should be operated close to the optimum to save biomass. This is crucial due to the rising cost of biomass (or for the use of bio waste with unknown quality).
- A biogas power plant should become more flexible towards changing input materials (to be able to re-act to the changing supply of biomass).
- A biogas power plant should be much more automated to allow operation by less experienced operators and to be more robust against mistakes in operation.

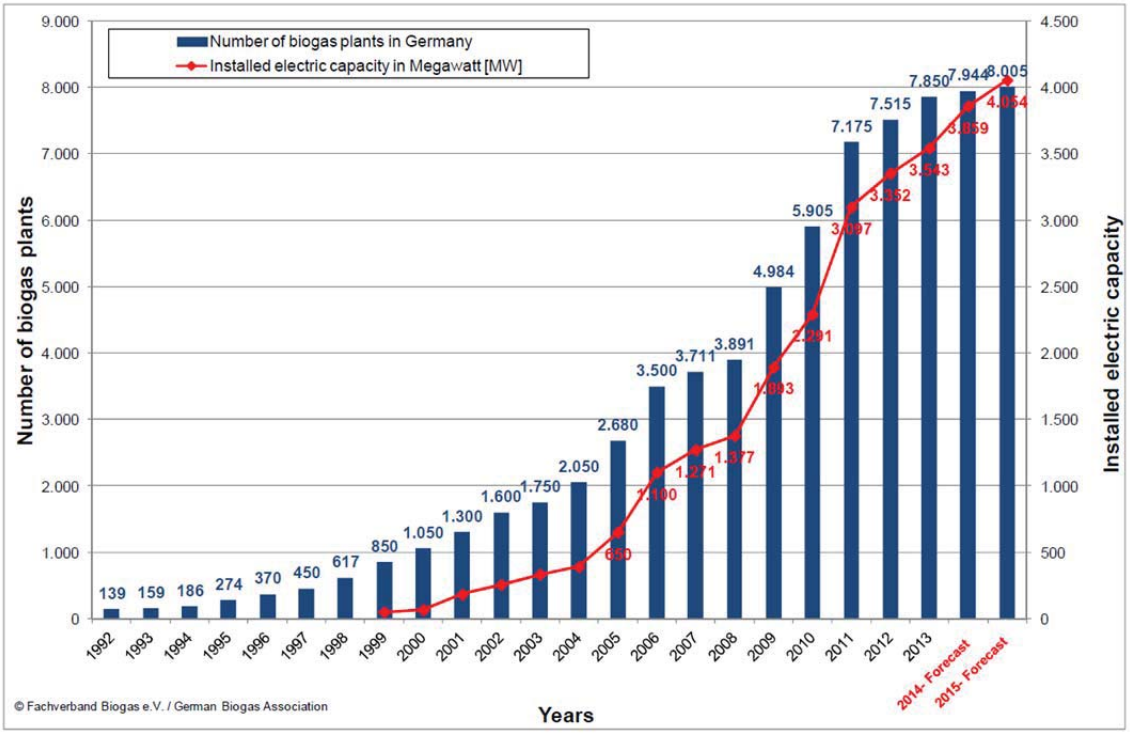


Fig. 1: Development of the number of biogas plants and the total installed electric output in megawatt [MW] in Germany [5]

This contribution describes technical components for making biogas power plants more flexible. Nevertheless, the main focus is a process for analyzing energy production systems and making them more flexible, more intelligent and better suited for integration into a smart grid or smart heating grid.

2. Regional energy concepts driven by biogas

The evolution of biogas power plants in Germany led to the setup of complete supply, production and value chains in rural areas – the so called bioenergy regions [2]. The idea of theses regional clusters is to connect the production and consumption of renewable energy in an intelligent way and to turn the role of rural regions from being an energy importer into being an energy exporter. This approach raises value creation for rural regions. Biogas power plants can play a key role in such bioenergy regions, if they compensate for the fluctuating supply of electricity from wind and solar power and provide heat to a heat grid.

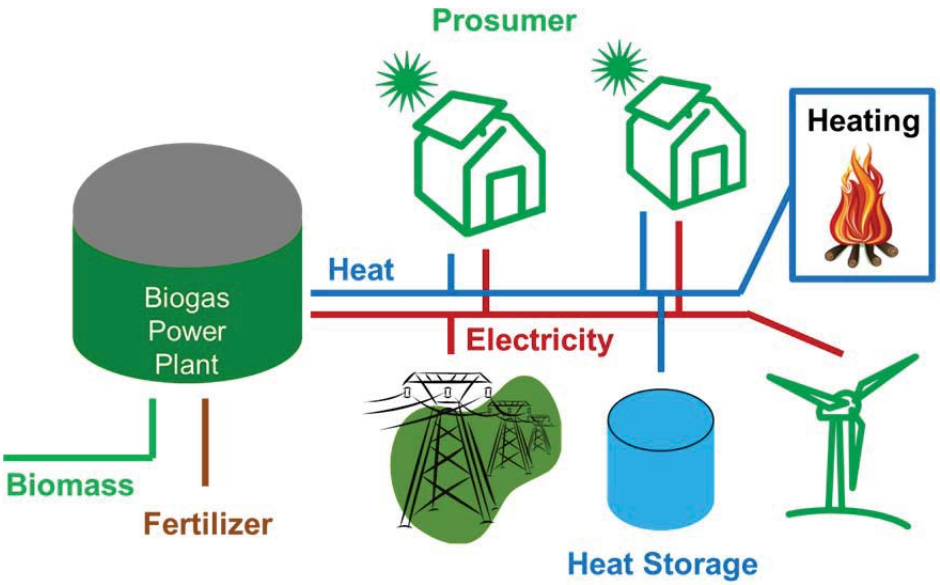


Fig. 2: Example of the setup of a bioenergy region with usage of biogas

The main challenges for the efficient operation of a biogas power plant in such regional bioenergy systems are:

- Balance demands for electricity and heat
- Ramp up/down block heat and power plant fast
- Dual/triple use for biogas (heat, electricity, fuel)
- Convert heat into electricity and vice versa
- Store heat, store biogas, store electricity (expensive)
- Steer demand, control production
- Adapt biogas production to changing demand fast
- Be flexible in terms of changes in biomass input quality and quantity
- Energy efficiency at all stages
- High degree of automation and good process stability

The target in such systems is to make every producer and consumer smart and to connect the components and control/optimize the system.

3. Smart biogas power plant components

Within this contribution, the optimization and “smartification” of two sub systems of a biogas power plant are described. The components of both sub systems have been developed with company and university partners within two projects funded by the German Federal Ministry of

Ecomics (BMWi) within the Central Innovation Programme for Small- and Midsize Enterprises (SME) called ZIM.

The **first project** aims to contribute to the automated and **optimized control of the biogas digestion process**. The digestion process takes place in the biogas fermenters and produces biogas from biomass by aerobic digestion [1,8]. The bio-chemical process is only partly understood and by today not controlled in a closed-loop-controller system but steered by setting fixed parameters and by keeping the process as stable as possible. Therefore, the main energy generation process of the biogas power plant is hardly controllable and inherently inefficient. Biogas power plant operators cope with this deficit by keeping all parameters as stable as possible over a long time. This forces them to feed exactly the same quantity and quality of biomass into the fermenter every day, keep the stirring and heating of the fermenter stable and hope for a stable gas production. Fluctuations in biomass quality lead to process deviations and are detected very late, since the digestion process needs several days to produce biogas from biomass (~ 100 days for 100% digestion, ~ 10 days for 80% digestion) [4,12]. The effect of stirring is supervised by visual inspection of the surface of the liquid substrate within the fermenter through a small window. In fact, operators are just guessing what happens in their fermenter and they control it by experience and a rule of thumb.

Challenges and problems of the Digestion Process Control are therefore:

- overfeeding/underfeeding of biomass => biogas oversupply/undersupply => waste of biomass (10% wasted biomass = 40 kEUR p.a. loss in a typical biogas power plant)
- insufficient stirring/excessive Stirring => biological problems, high cost for electricity (> 30 kEUR p.a. for a typical biogas power plant)
- early warning in case of biological process distortions => avoid electricity production interrupts
- biogas production prediction (e.g. 1 week) => necessary prerequisite for Smart Grid

To control the biogas production process, it is necessary to:

1. automate the feeding and stirring, make it steerable => done for most biogas power plants, the stirring and feeding is connected to the central PLC (Programmable Logic Controller) of the biogas power plant,
2. to derive a mathematical model for the digestion process as a basis for a controller development,
3. to derive process parameters from the model which can be obtained online within the biogas fermenter,
4. to develop sensors for permanent installation within the fermenter and online measurement,
5. to develop a controller (a control strategy) based on the measured parameters, which controls the feeding and stirring and which is validated with the model and the real biogas fermenter.

For step 2, a variant of the Anaerobic Digestion Model 1 (ADM1) [1] is used, which has been further developed towards the agriADM1 by Schlattmann [12,4]. The model can be simulated within the SIMBA framework with Matlab/Simulink [13]. It correlates well with real digestion data, fi it is operated in a narrow corridor around the optimum operation point. Deviations are difficult to simulate. Furthermore, the major relevant process parameters within the model cannot be measured efficiently online within the fermenter. Therefore, the model is only usable for the development of a pragmatic control strategy [15,16].

Based on the analysis of the model and various correlations of parameters [15,16], process control with simple process parameters like pH, Redox-Potential, Conductivity and Temperature is feasible, if additional information (feeding recipe, power consumption of stirring, regular offline analysis of parameters in laboratory) is used. Therefore, in step 4 and 5, of-the-shelf-sensors from industrial applications like waste-water-treatment can be selected. A major challenge is to operate such sensors within the biogas fermenter. First, the biomass substrate is chemically aggressive and causes a high mechanical stress in equipment, e.g. when it is stirred. Second, fermenters are only opened for maintenance, e.g. once per year. Therefore, sensors cannot be taken out for cleaning and calibration. Third, the fermenters are quite big (e.g. 2500 cbm) and the biomass inside is not homogenously mixed at all times.

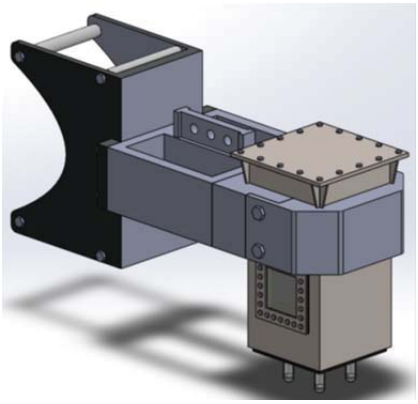


Fig. 3: Sensor head for online measurement in biogas fermenters

Our solution is a sensor head, which is mounted at a mast within the fermenter. The mast can be rotated and the sensor head can slide up and down. This technology is used for stirring devices, too. Therefore, it is proven and robust of the shelf technology. The sensor head is sliding down into the substrate for measurement. Afterwards, it is sliding up into a parking position, where it is cleaned (water), the battery is charged (wireless), communication is done (Bluetooth) and calibration can be done (with water). The sensor head contains off-the-shelf sensors for pH, Redox, conductivity and temperature. It can be equipped with future sensors, when available.

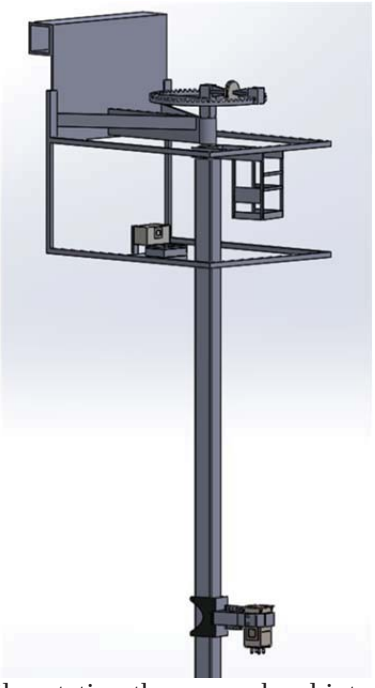


Fig. 4: Mast installation for sensor head within the biogas fermenter (test installation at university building)

Since fermenters are large, several masts can be installed within one fermenter at different positions. This allows interpolation and estimations about the substrate distribution in the fermenter. Furthermore, the mast and the sensor head can be used to control the stirring. By measuring the motor power while sliding the sensor head up and down, conclusions about the viscosity of the substrate can be drawn. By measuring the motor power while rotating the sensor head into the flow of substrate during the stirring, the stirring process can be controlled. Therefore, using the mast and the sensor head provides a simple system for measurement in-situ within the fermenter. Even with the currently available off-the-shelf sensor technology, a much better overview of the processes in the fermenter can be generated. The system is sufficient to avoid serious under- and overfeeding, excessive or insufficient stirring and it can detect biological process distortions much earlier [14,16]. If combined with an overall control system for the biogas power plant, the digestion

process is converted into a controllable, smart process. In combination with future measurement equipment for biogas fermenters [8,15], the fermenter can be developed from being a black box into being a flexible and adaptable energy production process.

The **second project** aims to contribute to the conversion of (waste) heat into additional electricity. As explained, many biogas power plants have limited options for a productive use of the heat generated by the block heat and power plant. A big portion of this heat is so-called low temperature heat (~90-100°C) which is mainly usable e.g. for heating of buildings. One option to generate additional electricity from this heat is the **organic rankine cycle turbine (ORC)** [11]. The project intends to develop a flexible and smart version of this type of turbines.

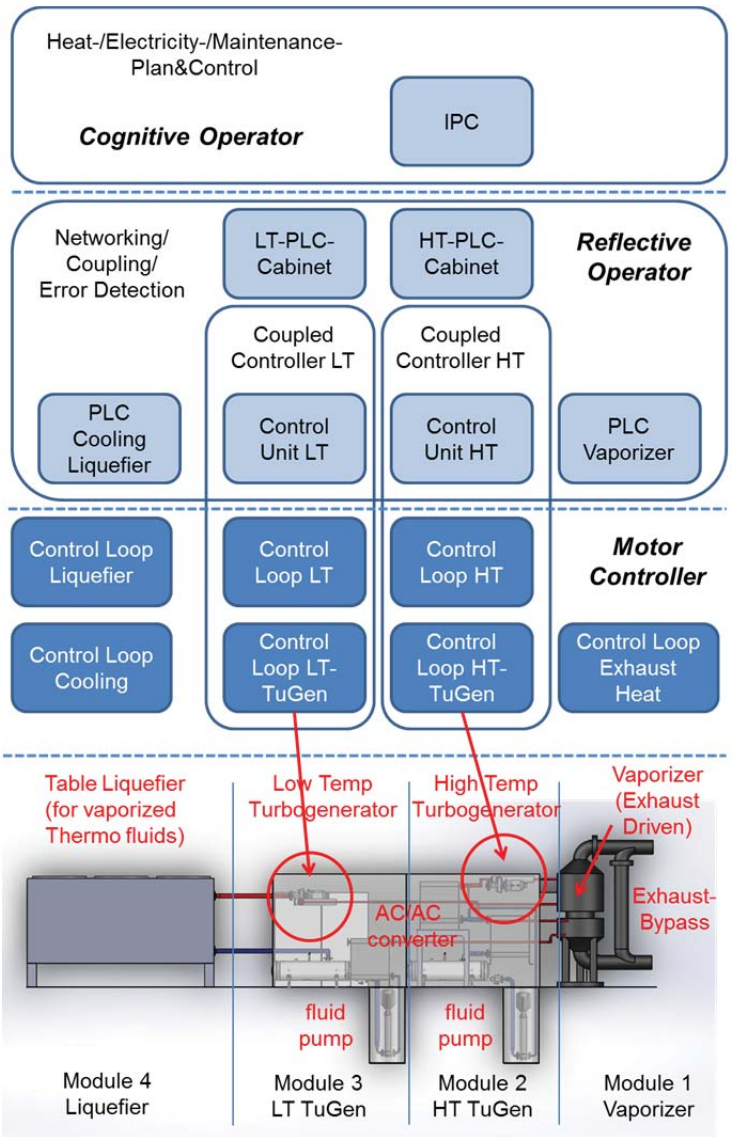


Fig. 5: Technology stack for a flexible, intelligent ORC turbine

ORC turbines are usually only efficient in one stable operation mode. Changing demand of electricity and changing supply of heat make the power generation process less efficient. Within a smart biogas power plant, the ORC turbine should be able to use the oversupply of heat. In an overall operation strategy driven by fluctuating electricity demand and an additional heat demand profile from possibly profitable heating scenarios, it is crucial to have a flexible component for the conversion of excess heat into electricity. Our ORC turbine achieves this by

using a two-stage-process with different thermo fluids for the two turbines. Furthermore, the turbine geometry can be adapted, leading to two efficient operation points per turbine. With this flexibility, different heat sources from the block heat and power plant (BHKW) like engine heat and exhaust heat can be used and the power of the overall system can be adapted. In combination with a sophisticated control approach, a flexible two-stage ORC turbine with low complexity and low cost is feasible. The design of the system is modular and the control system follows a layered, modular approach, too. Therefore, the technology stack for the control system and the development process for an efficient, modular energy system are similar to the approach for making the biogas fementer "smart". The technology stack and the development process can be refined into a more general "smartification process" for energy systems.

6. Development of the "smartification process"

The technology stack for the flexible energy generation components for the smart biogas power plant and for the integration of this components into a smart overall system is based on the Operator-Controller-Module (OCM), which is part of the methods, tools and processes for the development of intelligent technical systems [6,7].

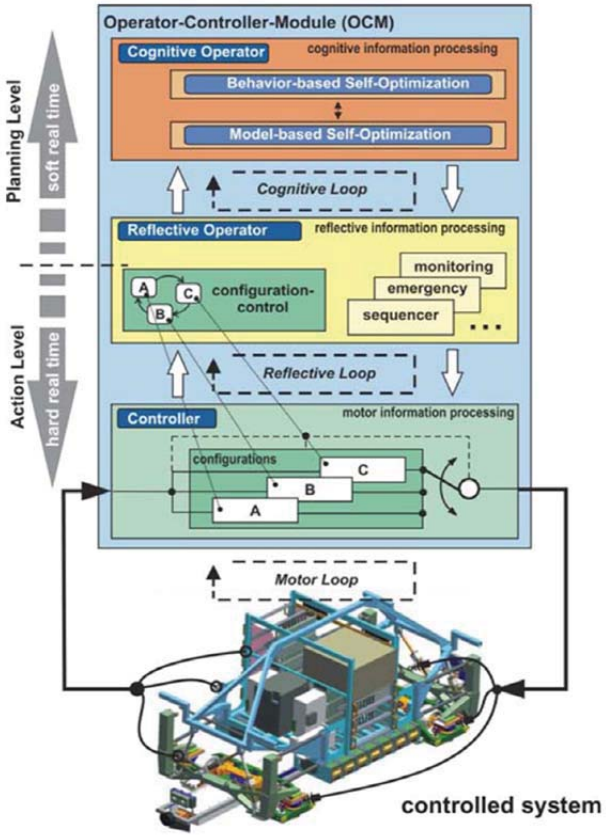


Fig. 6: Technology stack of the Operator-Controller-Module (OCM) [6,7]

The OCM technology stack is based on a three layer approach (partly derived from psychology) and support the separation of controllers with hard real time requirements from more complex and strategy oriented planning and controlling tasks. On the lowest level the motor loop is controlled by "classical" controllers. These controllers are developed in a model-based-development approach by setting up a mathematical model of the controlled systems and by developing optimized controllers which a simulated with the model and later with the real system (Hardware in the Loop – HiL). To make the approach flexible, these controllers can be

configured with different parameters, the may be exchangeable according to the operation mode and the parameter or controller change may be done during operation (re-configuration). The development and the technology stack for such kind of controllers is state-of-the art. The re-configuration is done by the next layer, the reflective operator. This is a rule-based system with state machines and service functions, e.g. for emergency notification. While the motor controllers may be attached directly to the different technical sub systems, the reflective operator may be part of the central control unit of the system. With the reflective operator, the overall system can be operated and it can be connected to other systems in a network or to a smart grid. For intelligent technical systems, a more sophisticated layer for planning, reasoning and learning is added, the cognitive operator. This layer can include strategies for self-optimization and machine learning. The user interaction can be added to this layer or to the reflective operator.

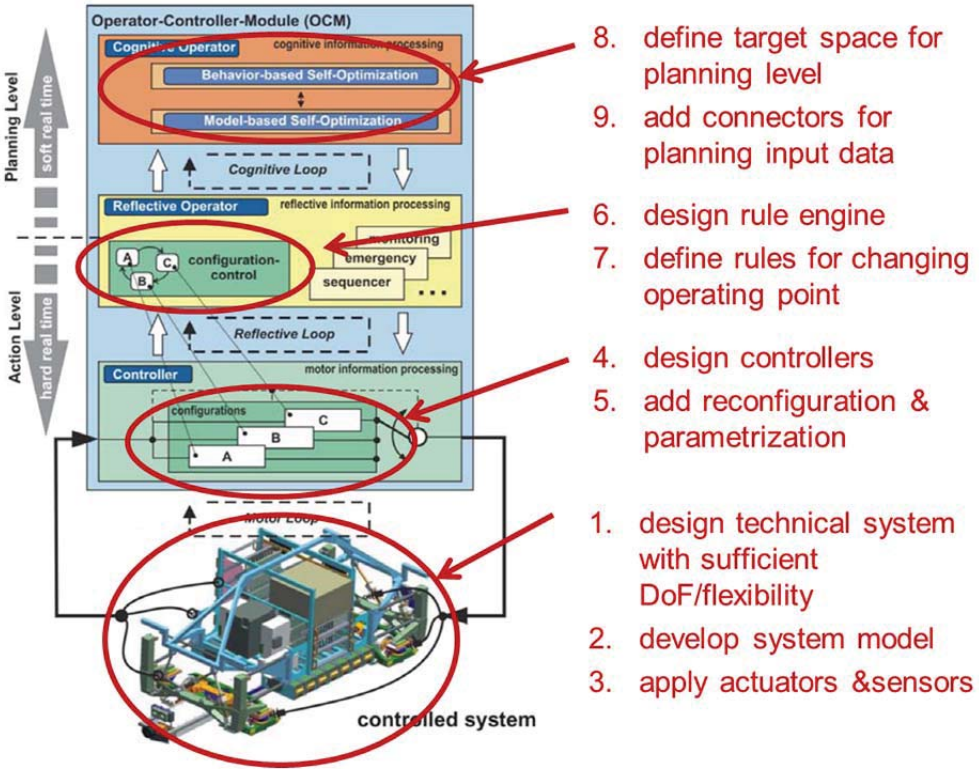


Fig. 7: 9-stage “smartification process” based on the Operator-Controller-Module (OCM)

The layered approach of the OCM can be used to structure the development process for smart systems and smart components. The resulting “smartification process” is structured into 9 steps, which can be executed sequentially or be iterated:

Step 1: *Design a technical system with sufficient DoF/flexibility:* To make motor controllers possible, the underlying physical system has to offer sufficient degrees of freedom (DoF) to allow controlling it with actuators and sensors. For the ORC turbine, this is achieved by building the two stage turbine system with adaptable turbine geometry and using different thermo fluids.

Step 2: *Develop a mathematical system model:* Based on this system model the controllers can be developed using model based design. In case of the ORC turbine this is possible. In case of the biogas production process this is difficult due to the deficits of the ADM1-model. Nevertheless, the more of the system can be described and modeled, the better the controller design will be.

Step 3: *Apply actuators and sensors:* Based on the model of the technical system and the intended steering of components, actuators and sensors have to be placed. In the case of the ORC turbine, this is complex but mainly state-of-the-art. In case of the biogas fermenter, placing the sensors is a major challenge.

Step 4: *Design of the motor controllers:* In case step 2 was done successfully, the design of the controller and its optimization and validation can be again done using model-based design. In case of the biogas fermenter, a heuristic control strategy is designed instead of developing a (mathematical) controller.

Step 5: *Add reconfiguration & parametrization:* In general, the behavior of controllers can be adapted by changing the parameters. Doing this re-configuration during operation is more challenging, since the system must not transition into an un-defined state. Exchanging the complete controller with a one better fitting to the operation mode can be even more challenging.

Step 6: *Design the rule engine and middleware for the reflective controller:* In this step, the re-configuration of the motor controllers and other operation modes are described e.g. by state charts or by rule sets. A middleware framework can be used to implement the reflective operator.

Step 7: *Define rules for changing the operating point:* Based on the degrees-of-freedom (DoF) of the physical system and the capabilities of the motor control loops, operating points for the overall system are defined and sequences for moving from one operating point to another are derived. These rules and sequences are implemented in the rule engine and the state charts provided in step 6.

Step 8: *Define target space for planning level:* On planning level, it is defined which operating points and which change sequences are desirable for the overall operation. Based on the demand curves (e.g. for electricity and heat), other operational plans (e.g. maintenance) and external information (e.g. price curves), the target space for the planning systems is defined. The target space exploration and the development of operation strategies can be implemented as a fixed system or be designed as a self-optimizing system [7].

Step 9: *Add connectors for planning input data:* the planning level of the cognitive operator (and possible parts of the reflective operator) can be connected to other systems, e.g. via a smart grid. On this level, technologies like Machine2machine communication or Internet-of-things (IoT) come in. Connecting the system to external networks requires additional efforts for security. Nevertheless, the layered approach makes it easier to be compliant with safety requirements, since they are mainly covered on the lower layers and only indirectly influenced by the cognitive operator.

7. Conclusion and further research

Smart Biogas Power Plants are valuable core components for regional bioenergy systems. Making them “smart” is based on several steps. For a certain sub system, solutions on all levels of the OCM have to be available or need to be developed. Methodology from Mechatronics Systems Engineering [7] provides the means for the “Smartification” of energy production systems like biogas power plants. Nevertheless, there are still a lot of gaps that need to be covered (e.g. better sensors for the digestion process). In general, the physical process of a certain sub system or component needs to be flexible and controllable to allow smart operations. If the process is understood and can be steered, setting up a system model is required. The operator-controller-module (OCM) delivers a good framework for the smartification of technical systems and for the structuring of the complexity.

As further research, a formalization of the “Smartification Process” as part of Systems Engineering Methodology [6,7] is required. Furthermore, a continuous design flow and tool chain for the engineering of Intelligent Technical Systems can support the process.

8. Acknowledgement

This research was funded by the German Federal Ministry of Ecomics (BMWi) within the Central Innovation Programme for Small- and Midsize Enterprises (SME) called ZIM (grant agreement numbers for FH Dortmund: KF2795207WD2 and KF2795210ST4).

9. References

[1] Batstone, D.J.; Keller, J.; Angelidaki, I.; Kalyuzhnyi, S.V.; Pavlostathis, S.D.; Rozzi, A.; Sanders, W.T.M. ; Siegrist, H.; Vavilin, V.A.: The IWA Anaerobic Digestion Model No 1 (ADM1), Water Science and Technology Vol 45 No 10 pp 65–73, IWA Publishing 2002

[2] Bioenergy regions: https://ec.europa.eu/energy/intelligent/projects/en/projects/bioregions and http://www.bioregions.eu/, for Germany: http://www.bioenergie-regionen.de/, last accessed Jul 24 2015

[3] Deublein, D.; Steinhauser, A.: Biogas from waste and renewable resources. Wiley-VCH, 2nd Edition, 2011

[4] Durmus, C.; Albertson, M.L.: Modification of Anaerobic Digestion Model No. 1 for Accumulation and Biomass Recycling. Proceedings of the Hydrology Days 2005, Fort Collins, CO, 2005

[5] Fachverband Biogas e.V.: Biogas Segment Statistics 11/2014, 2014

[6] Gausemeier, J.; Steffen, D.; Donoth, J.; Kahl, S.: Conceptual Design of Modularized Advanced Mechatronic Systems. 17th International Conference on Engineering Design (ICED`09), August 24-27, 2009, Stanford, CA, USA, 2009

[7] Gausemeier, J.; Kahl, S.: Architecture and Design Methodology of Self-Optimizing Mechatronic Systems. In: Mechatronic Systems Simulation Modeling and Control, pp. 255-286, InTech, 2010

[8] Gerber, M.; Span, R.: An Analysis of Available Mathematical Models for Anaerobic Digestion of Organic Substances for Production of Biogas, International Gas Union Research Conference IGRC2008, Paris, 2008

[9] Gesetz für den Vorrang Erneuerbarer Energien (Erneuerbare-Energien-Gesetz – EEG) (2012) vom 4. August 2011 (BGBl I, Nr. 42, S. 1634)

[10] Nakicenovic, N.; Grubler, A.; Inaba, A.; Messner, S.; Nilsson, S.; Nishimura, Y.; Rogner, H.-H.; Schafer, A.; Schrattenholzer, L.; Stubegger, M.; Swisher, J.; Victor, D.; Wilson, D.: Long Term Strategies for Mitigating Global Warming. Energy International Journal, 18 (5), 401-609, (1993)

[11] Quoilin S., Van Den Broek, Martijn, Declaye S., Dewallef P., and Lemort V: Techno-economic survey of Organic Rankine Cycle (ORC) systems, Renewable and Sustainable Energy(22), pp. 168–186, 2013

[12] Schlattmann, Markus: Weiterentwicklung des “Anaerobic Digestion Model (ADM1)” zur Anwendung auf landwirtschaftliche Substrate, Dissertation am Lehrstuhl für Agrarsystemtechik, TU München, 2011

[13] SIMBA: https://simba.ifak.eu/en, last accessed Jul 24 2015

[14] Weiland, Peter; Rieger, Christa: Prozessstörungen frühzeitig erkennen, Biogas Journal 4/06, online: http://biogas-infoboard.de/pdf/Seiten18-20%20aus%204-2006_komplett.pdf, 2006, last accessed Jul 24 2015

[15] Weitze, L; Kraft, E: Process control strategies of biogas plants in consideration of biogas yield stability - Limitations and Potential. In: Lasaridi; Manios; Bidlingmaier; Abelitos; De Bertoldi; Diaz; Stentisford (Hrsg): 7th International Conference ORBIT 2010 – Organic Resources in the carbon economy. Thessaloniki/Greece: Grafima publications, 2010

[16] Wolff, C., Strumberg, J., Knirr, M., Foerst, J., Tekampe, J., Hensen, C.: Distributed Sensor System for Control of a Biogas Fermenter Kandó Konferencia, Hungary, Budapest, 2014

"How Project Management Offices and Enterprise Project Management Offices can support Sustainability in Projects"

Ekomenzoge Metuge, Great Standard Consulting Ltd, Bonn, Germany

Key words: Project management office, Enterprise project management office, Sustainability, PMBOK®

Abstract

With the changing global business and economic meltdown, sustainability of enterprises, companies and organisations is now been recognised as one of the most important challenges of our time.
Although there are many definitions on sustainability, one guarding definition is the one that was developed by the "World Bank" as a requirement of our generation to manage the resource base such that the average quality of life that we ensure ourselves can potentially be shared by all future generations. ... Development is sustainable if it involves a non-decreasing average quality of life. [Geir B. Asheim, "Sustainability," The World Bank, 1994]

How then can organisations and companies develop prosperity without compromising the operations and future of their companies? This paper is trying to examine how well the use of EPMO and PMO concept can help bring about sustainability by linking it to project management. But how will EPMO and PMO help to support sustainability for projects?

This paper will try to presents a somehow maturity model that would provide a practical insights on these two methodologies EPMO and PMO support sustainability in projects.
Based on what EPMO and PMO all stands for and their rules and roles in organisations, I will examine how these two methodologies are helping to support the concepts of sustainability in projects.

Introduction

Companies, the world over that want to improve their project outcomes, provide critical project information for executives, or institute an analytical project decision process, are

now increasingly turning to the creation of an Enterprise Project Management Office (EPMO) as the change agent (white paper 2011). Regardless of the business function of the projects in question—from social, construction, oil and energy, services provider and marketing to IT projects, from client services to Research and Development, Engineering and Manufacturing, Finance and Distribution—a EPMO can be the best and only answer to better decisions, information, planning and execution. The responsibilities of the PMO can range from providing project management support functions to actually being responsible for the direct management of a project (PMI, 2004, p.369).

The PMO concept that we know today had become well established by the late 1990s (Dai & Wells, 2004, p.526). In a two-year empirical study in 2004 that investigated the establishment and use of PMOs and the environmental conditions in which they operated, Dai & Wells found that 113 of 234 responses from a random sample indicated having a PMO or similar entity. Of these, 'the overwhelming majority of PMOs were established in the mid-1990s to 2000´.

The PMO was originally conceived as means of capturing, sustaining and promulgating good project management practices throughout organisations. The role of the PMO has been expanded, however, to include analysis, communication, and decision support. The EPMO has become not only the centre of excellence for project execution, but management's lens for viewing project performance, and the platform for initiating sustainability in projects. Companies and organisations with successful EPMO or PMO like Almadar[1] Tripoli – Libya, Siemens, and Volkswagen are having a strong foundation floor, solid structural that is keeping them topping.

The concept of EPMO and PMO were created to helping organisations and companies be able to better manage and strategise projects for sustainability. Investing in projects especially designed to address environmental or societal needs, forward-thinking within the EPMO and PMO leaders are embedding sustainability goals as a core project management processes. Whether any company is creating a new product; like cars or designing a new mobile phone or funding a social project which is non-for-profit, sustainability ranks as a top priority during planning and ensure its presence throughout the project life cycle.

[1] Almadar ist he biggest IT and telecommunication company in Libya

Sustainability concept

According to Dyllick and Hockerts, 2002. “The balance between economic growth and social wellbeing has been around as a political and managerial challenge for over 150 years”

With the opinion of the stakeholders that these three goals, economic growth, social wellbeing and a wise use of environment, can be reached, without considering and effecting the other two, got widely accepted (Keating, 1993). With this widespread acceptance, sustainability became one of the most important challenges of our time facing organisations and their projects.

According to the World Commission on Environment and Development (1987) “sustainability requires also a social and an environmental perspective, next to the economical perspective, on development and performance”. In his book ”Cannibals with Forks: the Triple Bottom Line of 21st Century Business”, John Elkington identifies this as the ‘triple bottom line’ or ‘Triple-P (People, Planet, Profit)’ concept: Sustainability is about the balance or harmony between economic sustainability, social sustainability and environmental sustainability (Elkington, 1997).

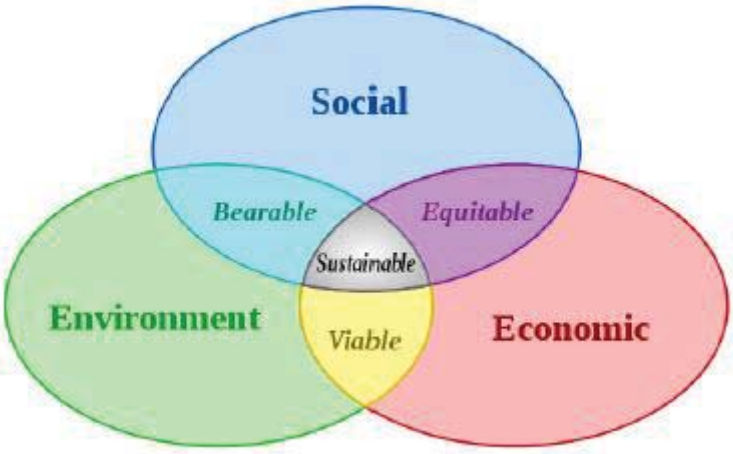


Figure1: The Triple-P concept of sustainability (source: Dyllick and Hockerts (2002), identify three key concepts of sustainability)

Sustainability is centred on the integration of the Economical; Environmental and Social aspects. This is referred to as the triple bottom or three-P concept as stated by Elkington (1997) as the ‘three pillars’ of sustainability: Social, Environmental and Economical (illustrated in

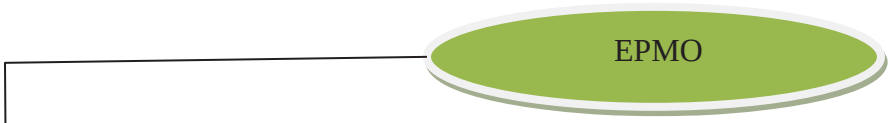
Figure 1). These three pillars are interrelated and therefore may influence each other in multiple ways. Although these interrelations are acknowledged, we should as well note that some regional differences do exist with regards to each pillar. In (Western) Europe, sustainability is mainly about environmental concerns, where in Africa the social concerns seem to be prevailing. This same applies to companies and their products or services.

EPMO supporting sustainability in projects

Enterprise PMO is a key enabler and foundation for effective enterprise portfolio management. The EPMO has become not only the centre of excellence for project execution, but management's lens for viewing project performance, and the platform for initiating project portfolio management in the future. Considering the challenges faced by the traditional PMOs, organizations are feeling the need for a business function that will help overcome the traditional PMO challenges. The need of a business function that is referred to as Enterprise PMO (EPMO) is a centralized business function which operates at strategic level with the enterprise executives and provides enterprise wide support on governance, project portfolio management best practices, mentoring, tools and standardized processes.

With all the above mentioned issues performed by EPMO, we then see that this will have a greater part to play in the support of project sustainability. Your EPMO most have a seat at the executive steering committee. Integrating the concept of sustainability in project management stretches the 'systems boundaries' of project management (Silvius, 2010).
EPMO Sustainability in projects and project management is about integrating economic, environmental and social aspects in the management and delivery of projects.
Although the concept of EPMO sustainability in project has just begun, it has a significant role to play for organisations that have value management principles.
Fingure below show how EPMO is been embedded into the three aspects of sustainability.

The EPMO needs to be sharply aligned with the business strategy. The EPMO seek to align their decisions with business strategy by communicating their own strategic objectives as simply and clearly as possible.
The EPMO sustainability support for project can be tabulated as below



Economic Sustainability	Return on investment (ROI)	-Direct financial benefits - Net Present Value (NPV)
	Business Agility	. Increase business flexibility
Environmental Sustainability	Transport	. Local procurement . Travelling . Transport
	Waste Management	. Disposition of waste . Recycling
	Energy	. Energy usage . Emission of CO2
	Resources and materials	. Reusability . Incorporated Energy
Social Sustainability	Labour, Decent Work and motivation	. Employment . Health & safety . Training & education . Organisational learning . Equal opportunity
	Human Right	. Child labour . Freedom of association . Non-compulsory labour
	Ethical behaviour	. Bribery and corruption . Procurement practices . Anti-competition behaviour
	Society	. Customer privacy . Community support . Stakeholder management . Products labelling . Market communication

Table 1: checklist of EPMO sustainability project support

Further EPMO is taking responsibility for elevating the standards for management and delivery of the programs and projects in a phased approach by line of business. For all business projects, the EPMO is simply not only about the portfolio of programs, products and services that are delivers but includes the rest of the organization's capital projects for a holistic view of the organisation for project sustainability. These issues are illustrated as in the figure below.

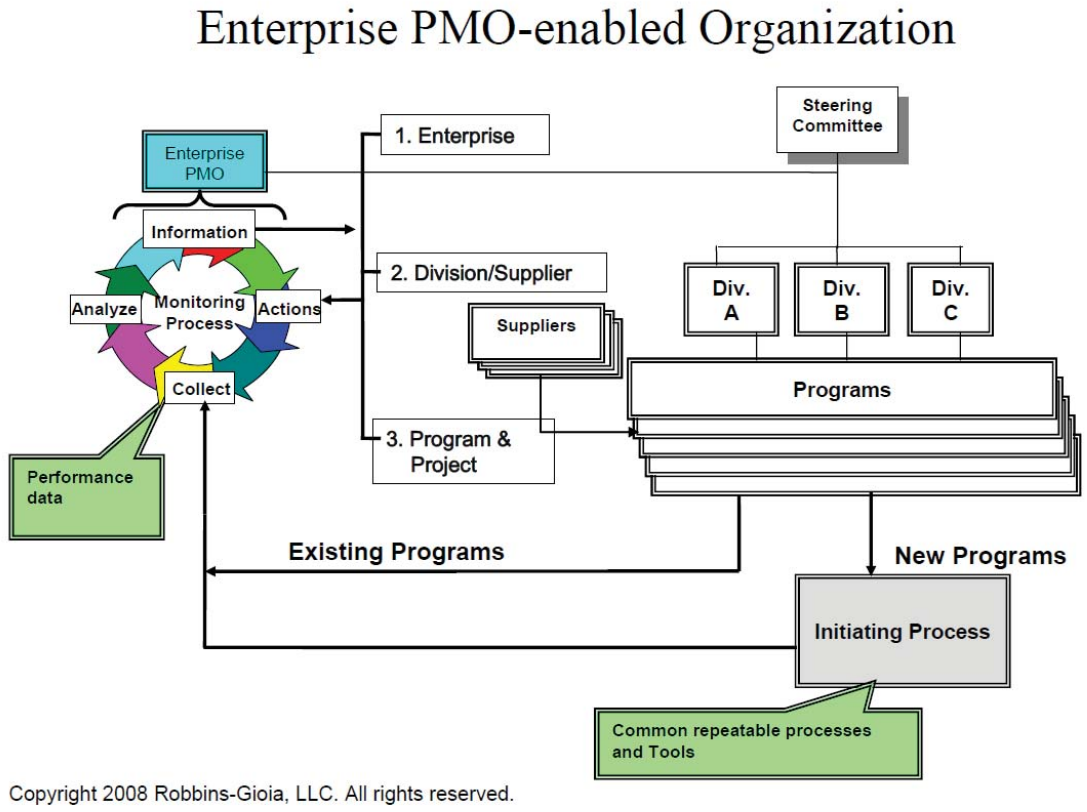


Figure 2 Enterprise PMO enabled organisation

EPMO and project control for sustainability

- EPMO track project changes with a completely configurable change control approach that allows project managers to choose which attributes of a project to track for which value will be added and thus help in sustaining it.
- In supporting sustainability in any organisation, the EPMO track programmes and projects with a consolidated view and executive dashboard.
- EPMO identifies risks and issues that maybe influencing programs and projects and then document their characteristics.
- Monitoring and analysing process, data collection taking actions to keep project on tract.

How PMO is supporting sustainability in projects

PMOs vary across organizations, but establishing the necessary processes and culture does not require starting from scratch each time. “I do believe PMO leaders should be consider unique in the world of leadership or fostering a culture of success”. Every organisational setup of today, knowing the truth about projects and the people responsible for its sustainability, the PMO is whom you should ask.

To meet time, cost and quality targets for project outputs, PMO uses its implementation expertise to provide advice on increasing the impact on value management, thus obtaining sustainability of its projects.

PMO helps to prioritize aspects related to social, economic and environmental sustainability, such as community engagement, national capacity development and even gender mainstreaming, in order to deliver added value to project beneficiaries and thereby keeping it on-going.

“Project Management Office (PMO): An organizational structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques.” According to the definition in the PMBOK® Guide, in adding value to maintain sustainability in projects can be grouped in as below

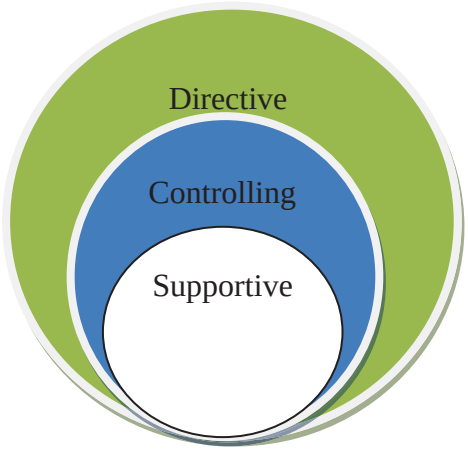


Figure 2: PMO types supporting project sustainability (PMBOK®)

From the figure above, the innermost circle representing what Supportive PMOs do in providing templates and best practices for sustainability, the middle circle representing what Controlling PMOs do in assuring that projects comply with those templates and best practices, and the outermost circle representing what Directive PMOs do in utilizing templates and best practices to direct projects to their successful conclusion.

We notice from the table below that some of the duties overlap as subset, so the best representation of these three categories on PMO sustainability support for projects would be as in the table below

	Description
Directive	Managing role to projects. Supplies templates, best practices, assures compliance through audits, and directs completion of projects.
Controlling	Support and compliance role for projects. Supplies of templates, best practices, etc. and assures compliance through audits.
Supportive	Consultative role for projects. Supplies of templates. Training and access to lessons learned on previous projects.

Table 2 PMO types and support

Another and most important value added support for PMO sustainability on project is also explained below

1. PMO in Monitoring and Controlling Project Performance
   - Report project status to upper management
   - Monitor and control of project performance
   - Implement and operate a project information system
   - Develop and maintain a project scoreboard

2. PMO Strategic Management

- Provide advice to upper management
- Participate in strategic planning
- Network and environmental scanning

3. PMO development of Project Management Competencies and Methodologies

- Develop and implement a standard methodology
- Promote project management within organization
- Develop competency of personnel, including training
- Provide mentoring for project managers
- Provide a set of tools without an effort to standardize
- Execute specialized tasks for project managers
- Manage customer interfaces
- Recruit, select, evaluate, and determine salaries for project managers

Conclusion

Both the EPMO and PMO do make great deal of contributions to the sustainability of project, thus the organisation at large. Therefore the concepts of sustainability are reflected in projects and project management. The aspect of EPMO and PMO in the integration of sustainability in projects and project management is now fully being recognised.

References

- Dai C.X. and Wells W.G. (2004) An exploration of project management office features and their relationship to project performance, International Journal of Project Management, Vol.22, 523-532.

- Dyllick, T. and Hockerts, K. (2002), Beyond the business case for corporate sustainability, in Business Strategy and the Environment, 11, pp. 130-141.

- Elkington, J. (1997), Cannibals with Forks: the Triple Bottom Line of 21st Century Business, Capstone Publishing, Oxford.

- Keating, M. (1993), The Earth Summit's Agenda for Change, Centre for our Common Future, Geneva

- Kerzner,H. (2003). Strategic planning for a project office. Project Management Journal, 34(2), 13–25.

- Geir B. Asheim, "Sustainability," The World Bank, 1994

- Silvius, A.J.G., Brink, J. van der and Köhler, A. (2010), The impact of sustainability on Project Management, Asia Pacific Research Conference on Project Management (APRPM), Melbourne.

- Project Management Institute (PMI), 2013: A Guide to the Project Management Body of Knowledge – PMBOK 5th edition, New Town Square, Pennsylvania

- White Paper , PMI 2011, IBM Keys to Building a Successful Enterprise Project Management Office

FORMS OF TRUST AND THEIR INTERRELASHIONS WHITNIN PROJECT'S LIFE CYCLE

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Keywords: Trust, trust management, co-working in virtual teams.

Abstract

The aim of this study is to provide an overview of the different forms of trust and mechanisms of establishing trustworthy relationships between objects of trust. We try here to put a stress on common aspects of forms of trust , their differences, the kind of logic paradigm they are based on, and the kind of issues they are likely to address well.

1. Introduction

In human societies, trust is a key notion in all kinds of relationships. It allows us to interact with other people in the safest way, even when we don't have all the necessary information about the subject of the communication, or about the communicants. In many cases, trust is a natural security layer in human organizations. For example, individuals who repeatedly behave in an anti-social or non efficient way are first distrusted only by their direct interlocutor, and then this "distrust" propagates itself and soon the whole community will be reticent to rely on such inefficient individuals, thus increasing the global quality of the collective work.

Typically, managers do not give proper importance to the concept of trust, not associating trust with results of management. Thus, very little time and attention is paid to building trust in the organization, considering as not important in managing processes. This can be explained by the fact of the opinion that people who are close to each other already have the opportunity to establish formal and informal connections.

On the other hand, the lack of trust in the organization leads to the fact that the staff is not trying to achieve maximum efficiency, sometimes even deliberately sabotaging future results. As a result, management has to spend extra time and attention to the control functions.

2. Background

Firstly, Francis Fukuyama brought up the importance of trust in 1995. Building trust has special meaning for social capital. According to Putnam trust is one of elements constituting social capital, together with norms and networks. Without this capital there is impossible the economical and social growth and building capitalism and democracy. Citizens need to have the feeling that they influence state affairs and live in the country characterized by culture of trust. Fukuyama, American politician, economist and political philosopher brought forward the issue of trust and social capital in his famous book entitled Trust: The Social Virtues and the Creation of Prosperity. New York: Free Press, 1995. Culture of trust is helpful in insecure and unorganized situations (Bjerke, 1999). Trust can be recognized as the strategy of dealing with uncertainty. For several years now, efforts have been made in order to define this notion of trust in a formal way, to analyze it, to build logical models simulating trust in the most accurate manner.

3. Forms of trust and their interrelations

It is important to understand the forms of interactions between objects of communication. Connections: person - person, client – worker, worker - worker, client – organization, worker - organization, organization - organization. Interaction and objective of cooperation in each case is different and trust also is formed by various methods.

At the initial stage of communication the so-called fast trust is formed (swifttrust). This is especially important for connections: client - worker, client - organization. The phenomenon of formation of such trust is characterized by that the object of trust, without any clear information, is guided only by positive stereotype. The benefit of a swifttrust is the possibility to interact quickly in the absence of sufficient information. The drawback, though, is that swifttrust can be destroyed as fast as acquired. It is believed that swifttrust works well in the short term (up to six months). Therefore, relying on this mechanism is advisable in case of a short-term interaction.

If the project (or interaction between objects of trust) lasts more than six months, it is recommended working on long-term trust, which is based on three parameters: security, personal qualities, professional significance.

People usually try to understand and assess the safety for others: how much they can trust even before transmit any information. Human security, first of all, is determined by the damage that it can possibly cause (not

necessarily financial loss, it can be a moral, ethical or emotional loss as well), and, secondly, the danger of self-worth in the eyes of the other person. In this connection, each link must relate to communication and information received with caution, clearly following the ethics code.

Personal qualities such as reliability, integrity and altruism. Reliable person usually does what one said, what is more - performs one's duties on time, or clearly explains why they cannot be fulfilled. The degree of trust can also be defined by person's integrity. Holistic person usually has developed a hierarchical system of values as well as system of the goals, and acting in strict accordance with these values and goals. Working with such a person, we usually know what to expect. The ability to overcome one's own self-absorption and take a different view into account are also added as an important part of the holistic personality. The person must accept others not only as a source for receiving and transmitting information, but also as a valuable partner for communication.

Professional significance consists of competence, status and social capital. In practice, the level of trust to the person depends on how the other team members assess its relevance to the objectives of the team.

In long-term projects attention should be paid to a number of factors of a stronger confidence, the main of which are security, personal qualities and professional significance. Headship has the ability to influence these factors, thereby increasing the level of trust in the team and beyond.

4. Results and Conclusion

The efficacy of the team depends largely on the quantity and quality of contacts between its team members .In teams that work on long distances the number of contacts between people usually decrease, which may affect the ability to transform into one cohesive team. Therefore, it makes sense to give special attention to the promotion of communication through the creation of a favorable climate of trust between people. The short-term projects lasting up to six months are working on a mechanism of creating rapid confidence-based on the use of positive stereotypes in a lack of information about people. In a more long-term projects attention should be paid to a number of factors of a more lasting credibility, the main of which are security, personal qualities (Reliability, integrity and altruism) and professional significance (competence, status and social capital). The manager can clearly influence these factors, thereby enhancing the the level of confidence in the team, using specific methods, main of which are personal example (role modeling), the mechanism of transmission of confidence, skilled trainings for self-management and delegation of powers.

5. References

[1] Bjerke, B., Business leadership and culture. National management styles in the global economy, Edward Elgar Publishing, (1999)

[2] Bushueva N., Gotz V.: Strategic confidence as a factor in the effectiveness of organizational change / Managing the development of complex systems № 12, (2012)

[3] Fukuyama, F., Trust: The social virtues & the creation of prosperity, New York: The Free Press, (1995)

[4] Koretsky A.: Management of trust in virtual teams . Magazine IT Manager (2011)

[5] Grudzewski W.M., Hejduk I.K., Sankowska A., "Trust Management - The New Way in The Information Society", Economics and Organization of Enterprise, Volume 2, Number 2 / (2008, p. 2-8)

[6] Grudzewski W.M., Hejduk I.K., Sankowska A., Wańtuchowicz M., Trust Management in Virtual Work Environments: A Human Factors Perspective, CRC Press Taylor & Francis Group, (2008, p. 38)

Review of interaction of quality management methodologies and concepts during project implementation

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Keywords: quality management, project management, methodologies, standards, project, interaction, life cycle.

Abstract

In this work the most well-known standards, methodologies, concepts and methods of quality management have been reviewed and analyzed, as well as problems preserving the quality of the project throughout of its life cycle identified.

1. Introduction

One of the most important issues is the quality of a project. Because the final goal of the project is to achieve its objectives and meet all customer's requirements.

By observing the norms and standards, the company is focused on the fact that "Quality – is above all." Quality assurance of the project is a guarantee of the highest level, which allows the customer to confidently buy the product that fully meets all of ones requirements. At the moment, open questions remain out of quality management, the best quality, quality criteria and many others. There is no clear answer to these questions.

Most of the proposed methods are now focused on product quality, so as to mid-60s it was the main criterion for the project success. However, the release of international standards ISO 9000 marked the transition of international standardization to a new level. These standards are related directly to production processes, management and set clear requirements for quality assurance. They laid

the foundation for quality system certification. There ia also an independent branch of management - quality management.

The purpose of this paper is to review and analyze the basic methodologies of quality management, identify problems of interaction between methodologies and find the way how to improve quality in the process of project implementation.

2. The emergence and development of quality management sphere

The ideas of quality management were laid by F. Taylor at the beginning of the twentieth century. His methodology is aimed at maintaining the quality of the final product or details. The continuer of researching quality management was the American scientist C.E. Deming, who introduced the quality management as a model of "quality spiral" - continuous and consistent steps on improving the quality during the whole life cycle of products, works, services, etc. The next stage of development is the emergence of the concept of total quality control (TQC) - advanced in the 1950s by the American scientist A. Feigenbaum. The level of quality should be set at early stages of planning then quality control is much more effective in the process of project implementation. It is replaced by the concept of total quality management (TQM), which was adopted at the world level in the family of standards ISO 9000. The principal difference of new concept is that it is not the quality of the individual products in the first place, but the idea of constant quality improvement at all [3].

At this stage the development of the quality management sphere does not end. There are many scientific papers, articles, theses on this topic, each researcher makes it own corrections and ideas for the implementation and quality control of projects.

3. Perceived Problems

On the way to quality assurance of project management in project environment there are problems which are related to the lack of clear process of the rational scope of work definition required for quality control and the lack of well-organized interaction of methodologies and concepts in quality management at different phases of the project life cycle. [1].

During the project implementation different kinds of project management methodologies for quality realization of concrete phase in the project can be used at every step. But on the transition from one project phase to another the project's quality can be lost as a whole. Therefore, it is important to choose and use the necessary methodology and concepts of quality management at different phases of the project life cycle in order not to lose the quality of the project upon its completion.

Practice shows that regular quality management during the project implementation allows to identify the possible problems at the early stage and to solve them properly.

The quality management in projects is generally based on the international quality standards ISO, the total quality control approaches (TQM), the international knowledge base concerning Project Management (PMBOK), the improvement system of Kaizen, 6 Sigma methodology and others. However, during the project realization there are the situations when it is necessary to make management decisions as to the further development of the project, in particular the search and selection of optimal options or modification of the project, the project continues without any changes, stoppage or lay-off. Making such decisions is carried out under the analysis of the main indicators of project's quality, but it is not always sufficiently justified and formalized [2].

4. Results and Conclusion

In modern practice the Project Quality Management requires a systematic approach, the implementation of which is carried out in the form of creation of standardized quality management systems (QMS), which is a set of documented methodologies and tools for planning, quality assurance and control, performed by designated structural units of the organization (enterprise or project) [2].

In view of the aforesaid, it is necessary to establish a system of project quality management consisting of several different methodologies that will fit to all phases of the project life cycle and will not break the integrity and will provide a high quality of project results. The Quality System will allow to make justified management decisions regarding further development of the project and will take into account the possible changes in the values of quality indicators.

While investigating the issues of quality management in project management the most well-known standards, methodologies, concepts and methods of quality management in the projects were considered, their comparative analysis was carried out.

References

1) N.V. Dotsenko: Project Management: planning processes project activities. Tutorial, I.V. Chumachenko, V.V. Morozov, N.V. Dotsenko, A.M. Cherednichenko. University of Economics and Law "Krok", 673p., (2014)
2) S.D. Bushuev Guidelines on Quality Management in Project Management:
3) Y.I. Rebrin: Quality Control. Textbook. TSURE, 174p., (2004)
4) Standard ISO 9001:2008 Quality management system – Requirements.
5) Quality management systems — Guidelines for quality management in projects (ISO 10006:2005 E), 36 p., (2005)
6) Total Quality Management (the articles): http://asq.org/

Communication, creativity and culture

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Abstract

As one of the main goals of each and every project is to fulfill requirements and expectations of people involved in and influenced by the project, the area of communication with stakeholders is becoming more and more crucial for project success. In order to actively involve stakeholders in the project and benefit from their involvement, stakeholders should be properly communicated during the whole project. It is a task of a project manager to overcome the whole cycle of stakeholder management and develop appropriate communicating strategies and methods and what is more important creativity to structure a co-work appropriately. Usually a team uses them to enhance the processes and quality of the product they are working on. Moreover, creativity tools are used during each and every project phase as they are mainly improving project communication.

Key words: *communication, stakeholders, creativity, TRIZ, Brainstorming*

Introduction

In the following work communication strategies, methodologies and tools are analyzed based, on the numerous scientific works by Ralph L. Kliem, Barbee Davis, Sheen, as well as other resources, including internationally accepted standard, as PMI. As stated in "A Guide to the Project Management Body of Knowledge" (PMBOK Guide) – Fifth Edition, 'Effective communication means that the information is provided in the right format, at the right time, to the right audience, and with the right impact. Efficient communication means providing only the information that is needed'. Setting open, continually improved and appropriate channels of communication on every level of project personnel and stakeholders is critical to ensure the flow of guidance and directions from customer to the team and warning of risks and probable changes to empower early arrangement and risk management actions. Creative thinking fosters communication and thus fosters constant project improvements. The problem with communicating by following conditioned patterns is communication is far less effective. In these instances, a person needs to be creative when communicating. A person needs to be open-minded, curious, optimistic, non-judgmental, flexible, and imaginative. The aim of the following work is to make a thorough analysis of interconnections between communication and creativity that is taking place during the project and study the most typical approaches related to communication in different

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countries/cultures and which communication tools and strategies are more applicable for projects in these countries. Due to globalization processes an employer (customer) can collect the best expertise, practices and skillset within his own team. In this very case customers are not limited by country boarders.

1. Communication strategies and methodologies

Stakeholders play a big role in the whole project management practice as it refers not only to the team itself, which performs the project, but to all the people, companies, enterprises, that somehow in a direct or indirect way are influenced by the future result of the project. That's why it is very important to study stakeholders and understand how these different groups of stakeholders communicate (and should communicate) to make the project successful. So that effective stakeholders management concentrates on "continuous communication with stakeholders to understand their needs and expectations, addressing issues as they occur, managing conflicting interests and fostering appropriate stakeholder engagement in project decisions and activities" [PMI13] (PMI, 2013). According to Project Communication Handbook by Office of Project Management Process Improvement, project communication is the exchange of project-specific information with the emphasis on creating understanding between the sender and the receiver. Effective communication is one of the most important factors contributing to the success of a project [OFF07] (OPMPI, 2007).

There are six dimensions, which describe the communication:

1. Content (what type of things are communicated)
2. Source (by whom)
3. Form (in which form)
4. Channel (through which medium)
5. Destination/Receiver (to whom)
6. Purpose/Pragmatic aspect (with what kind of results) [ASH07] (Ashalatha D., 2007).

All of them should be taken into consideration when planning this process with the stakeholders. According to PMBOK 5 there are three methods to share information with the project stakeholders:

- Interactive communication: the most efficient way of communication to ensure common understanding among the participants on specific topic and usually held between two or more parties.
- Push communication: this method pushes information to the recipient, when the information needs to be distributed, but doesn't ensure the process of receiving of the information.
- Pull communication: receiver of the information accesses it when he needs it; this method is used for large volumes of information or large audiences [PMI13] (PMI, 2013).

In the very beginning of the project manager should introduce each team member to each colleague to start efficient co-work and in the future to make the team be on the same page. That will lead the project to success. On the other hand during the process of communication some pitfalls affecting the discussion may be met. For

example, various emotional factors, need, personal motivation, level of intelligence, defensiveness, etc. Organizing workshops and gathering team members together for meetings are a good starting point. A project manager should also invite a project team on a kick-off meeting in order to discuss the goals of the project, main objectives, and the roles of each team member. Usually after a kick-off meeting a Project Manager sets up a "Start workshop" meeting where the team expands project scope and other topics discussed during kick-off with help of their ability to do it in a creative way. It should be stated creativity is a vital element in the success of any project because of the simple fact that projects seldom run as precisely as planned. [KLI14] (Kliem, 2014) To push the project forward and to generate new bright ideas and features the team can use a few helpful creativity tools such as brainstorming, TRIZ, etc.

1.1. Brainstorming

Brainstorming itself is a technique used by one individual or a group of people with help of which efforts are made to find a right way out (or new ideas to push a company further) against list of problems appeared by collecting a set of ideas spontaneously generated by team members. The Brainstorming technique was invented by Alex Osborn. This original approach published in an Osborn's book "Applied Imagination" presented to the public in 1953. His general method of ideas generation is described on the graphic below:

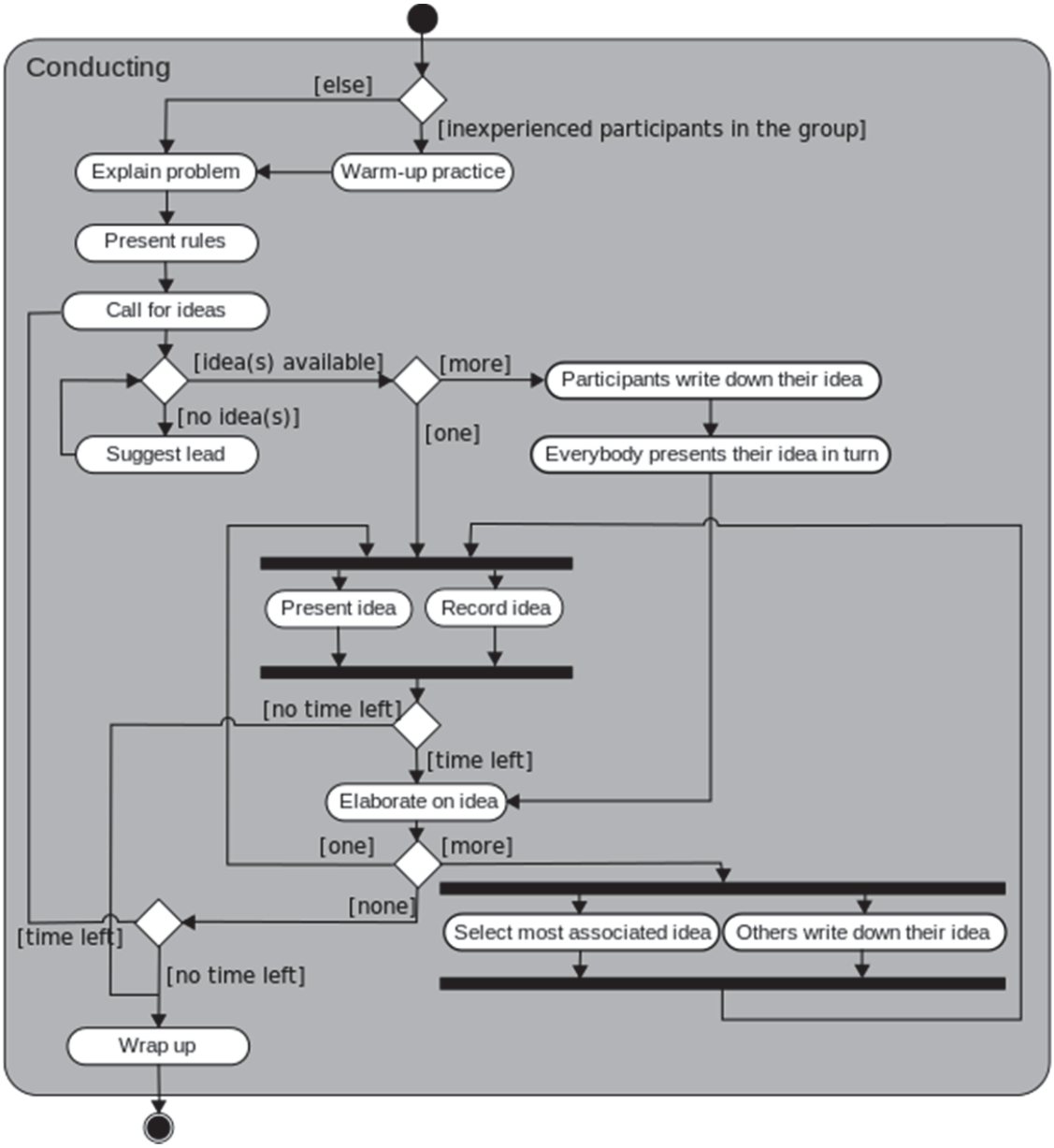

Figure 1. Example of Brainstorming Procedure, Applied Imagination [OSB63] (Osborn, 1963).

Osborn's method is aimed on: - Reduction of social inhibitions among group members; - Stimulation of idea generation; - Increase of overall creativity of the group [OSB63] (Osborn, 1963).

How to use the tool:

1. Project Manager must prepare the team. Comfortable environment, fresh air, well-lit room must be organized. The amount of introductory information must be optimal (not too much, not too limited amount). Participants must have as wide range of disciplines as possible differing between each other and should not be like-minded. White board or big screen must be used to stick and show to the whole team ideas generated.

2. The problem must be presented. Meeting leader must present the problem in a clear manner. Then the time must be given to the people at the very beginning of the meeting to generate as many their own ideas as possible. The next step is to ask participants to share newly-created ideas by providing everyone with a fair opportunity to participate in discussion.
3. Guide the Discussion. After the group has generated the first set of ideas, participants shall discuss the ideas of each other's and use them to create new ideas. Thus, the first set of ideas ping creating the new ones. This very process is the most important procedure of group brainstorming. In case if brainstorming meeting is time-consuming, a few breaks must be taken to make people proceed concentrating effectively.

Main principles of brainstorming are:

1. Focus on quantity. That means that the greater an amount of ideas generated the higher probability of creating the most efficient solution against problems.
2. Withhold criticism. Any created idea should not be under any critical rhetoric from team members. By eliminating critics participants will feel free to create unexpected and unusual ideas.
3. Welcome unusual ideas. These unusual ideas may help in resolving a no go situation and help in forecasting solutions for probable future problems.
4. Combine and improve ideas [MIN15] (Mindtools, 2015).

1.2. TRIZ

Actually brainstorming usually depends on intuition and the awareness of the team members about certain working domain and topic discussing during brainstorming meeting. Moreover, the results of brainstorming may be unexpected and non-recurring. As a matter of fact a great amount of probable solutions may be missed, just because they are out of scope of expertise of people participating in brainstorming. On the other side, such a tool as TRIZ has another problem-solving mechanism. TRIZ is a technique structured on logic, information and analysis, but not intuition [MIN15] (Mindtools, 2015). It was created with help of past experience of a great number of engineers to support the ability of a team to deal with problems creatively. TRIZ assure predictability and accuracy to the problem-solving process having well-organized and scientific approach.

Main statements of TRIZ theory are:

1. Problems and solutions to them are repeatable within industries and other spheres. By understanding the "contradictions" in every problem, a person may forecast right creative solutions to this problem.

2. Patterns of technical analysis must be recurred within industries and sciences.

3. Innovations usually use scientific effects outside the area where they have been developed. [MIN15] (Mindtools, 2015).

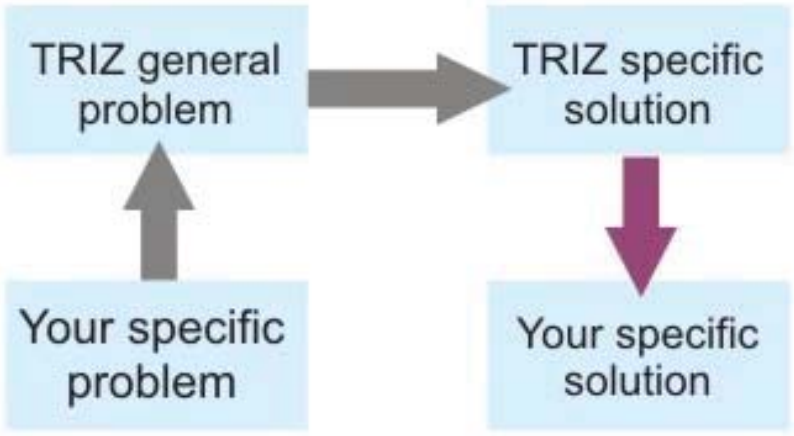

Figure 2. The TRIZ Problem-Solving Method [MIN15] (Mindtools, 2015).

Here the user defines his\her specific problem and compares it to the similar TRIZ problem. Based on the solution provided by TRIZ to its problem, the user apply this solution to his\her problem.

1.3. Other techniques

There are many tools and methodologies to support creativity (particularly in IT sphere) presented on the table:

Technique	**Example**
Lateral thinking (Edward de Bono)	Aimed of provision of reasoning which is not obvious at the first time and generated ideas may be impossible to implement.
Six Thinking Hats, of Edward de Bono	Each color of a hat is associated with distinct direction. These hats demonstrate problems and solutions to the idea the participant might face.
Brainwriting	Is another type of brainstorming during which the leader of the meeting lists all problem on the board. Ideas are not being discussed or cancelled during the meeting. One of the example is 6-3-5 method. Each of 6 group member write down 3 ideas and passing the list to the second team member. The second person develops these 3 ideas by adding his\her own ideas to each of them.
Think outside the box	Means to look further and not to think about the obvious things, but to think about the things outside the traditional scope.

Table 1. Creativity Tools. [Own Source]

Own source Communication is blood of organization that makes company vital, fresh and alive. Here an emphasis on implementation and control of proposed communicational concepts, processes, forms and creative tools in Project Stakeholder Management has been made. The number of meeting types (kick-off, start workshop, daily and weekly meetings, etc.) and creativity techniques used during them are proposed to improve the communication aspect, as well as vital issues that may occur during the communication with stakeholders.

2. Communication styles in different countries and application of creativity tools

At the current situation business world is getting more and more globalized. To succeed with the project many customers decide to organize a team working on the project from different locations, countries. Such a decision is not a surprise because of the globalization. Due to this opportunity an employer (customer) can collect the best expertise, practices and skillset within his own team. In this very case customers are not limited by country boarders. The only one question for the project manager is to find the approach to each international team member while communicating.

If the project is planned to be international (resources will be used from different location, i.e. the team will be splitted between different locations), then the customer will choose the countries with better conditions for business and for the project itself. Such factors as legislation, political situation, level of country development and employees expertise in the country influence mostly on choosing that place for the project, thus project manager must be aware of the cultural and communicational habits of their representatives [DCO11] (Dcosta, 2011).

To meet fast changing needs of the modern world, organizations tend to find new ways to provide new innovative products and services of the better quality and at more affordable price to their customers. But not only economic or political aspects are counted, but also successful and creative approach to communication. Inappropriate for a specific country communication method can cause the project failure, therefore it is important for a project manager who works on the international project to manage the risks related to customs and communicational traditions specific to the international project.

Communicational habits and styles typical for such countries as the Germany, United Kingdom, India and Belarus are different. The way in which their representatives are doing business (and particularly IT business) and of course communicate is visibly different.

2.1. United Kingdom

Almost the only one nation in Europe, (with some similarities to Belgians), Brits strongly put diplomacy before directness while communicating.

Representatives of UK are usually very positive in business situations. They believe disputes and arguments may probably harm the opponent. Such behavior can even make the British to seem ambiguous in meeting. In their opinion Brits are trying to say negative issues in a positive manner. For example, by saying “You failed”, they will say “I suppose we have made a few tinny mistakes that would be great to fix”. And an absence of interest concerning some topic is often showed as "Hmm, may be interesting." Humor is usually used while

meeting to calm the situation, to make negotiations less emotional. That is counted as bad manners as if you are talking a lot about your personal success.

The Brits encourage making decisions within a team environment. A good manager will work on setting creative atmosphere in a room where the team a gathering during meeting. Moreover, team-building activities as going together to play snooker will help in generating new ideas afterwards. But on the other side, they have no problems in finding the one person to blame in case of failure. Each team member usually has a certain level of specialization. Thus, he or she is expected to take a fresh and innovative view of the project. [OLI15] (Oliver, 2015)

Analyzing Brits we can come to conclusion that such technique as brainstorming will definitely suit British team and will work perfectly to make a ping in generating new ideas. As British companies tend to support open-minded managers rather than specialists any creativity technique (for example, Six Thinking Hats or brainwriting) will be supported by the team. There are a lot of meetings (that are usually conducted quite often) in the UK and that often fail to produce the desired decision, thus project manager should limit the participant in choosing only one decision within 10 minutes before the meeting ends. Brits say: "There is no point having a meeting with the Germans (for example) because they have already decided the outcome prior to the meeting." [WBC15] (World, 2015).

2.2. Germany

In aspect of preparation for the meeting German are the first probably not in the whole world but in Europe at least. This direct approach in showing and debating your point of view may sometimes be counted as inflexibility and pedanticism. But in fact it is not so, as they are usually keen on supporting their opinion based on the data researched. In contrast to Brits German like relying on the time-proven opinion of specialist rather than generating new ideas. Team members will pursue others in agreeing on exactly their idea. And sometimes meeting seem to be really heated. As German are quintessentially individualists such creativity technique as brainwritting must work here. While upgrading the ideas of each other that may cause a problem to define and agree on only one idea presented. In this very case the supervisor or meeting leader must made a decision by his own. [WBC15] (World, 2015).

For such kind of nation Morphological creativity Methods (Tableau, Matrix) may be applicable to foster idea generation. [PAT15] (Pratumtong, 2015)

2.3. Belarus

The opposite situation to British way of communicating is presented in eastern IT country, in Belarus. As the power of manager here is very high, the communication and behavioral aspects directly depend on the level of power a person possess and on the hierarchical structure of the company. There meetings and communication

itself are not aimed on generation of the best idea together, but on making every team member informed about the decision made by the boss. Debating is not usually supported in case if the company is not originally American or British. Otherwise the majority techniques may be applicable to ideas generation and creativity development. In Belarus it is typical to engage the group of two (maximum four) people into discussion of serious questions. Usually this group consists of leads of the project/company. Moreover, quite seldom during such kind of meeting absolutely new and fresh ideas are born. Each participant comes to the meeting having the solid vision and attitude to every point stated in agenda. A person who has no access to these meeting usually cannot influence on the decision-making process. Meetings and conversations are usually conducted in a very serious manner avoiding any kind of jokes. Spreading creativity and new ideas within the organization is an extremely difficult process for Belarusians, as that means an integration of changes.

The culture may be described as a change resistant and shy at some point. That's why it is almost impossible to motivate a huge group of people to share your ideas and thoughts. Thus, the representatives of Belarus usually trust experts' opinion and lessons learned by top managers. In this very case it is recommended to apply TRIZ to drive from the dead-lock ideas generation in typical Belarus-based Company. Integration of other creativity techniques must be done step-by-step without rush to make every employee used to changes. [BAB15] (Babitskaya, 2015).

2.4. India

Originally the country is seen as an outsourcing location for many countries aimed on cost reduction. The low cost of production is caused by the big population and what is more important the educated population. But nevertheless, the IT industry in the country is well developed and the majority of local IT companies are working with representatives of western world. Moreover, such companies with solid western partners are adapting to their way of doing business and communicating. On the other side, traditional Indian businesses are mostly focused on relationship-oriented communication. Debates may be interrupted with discussion of personal topics, so called small talks. Meeting and communication take much time to come to the logical end and come up with decisions. And this decision-making process is similar to Belarusian one, as the majority of final decisions is made by the Top manager or boss without asking any advice of lower level employees. The team usually expects receiving instructions and prescriptions from management to follow them obediently. [WBC15] (World, 2015).

Being an enormously hierarchical society, Indian top management will never allow workers interfere in company's or project's affairs. As it was suggested above to such centralization of power TRIZ creativity tool is mostly suitable. Here, either TRIZ approach or individual brainstorming will be used only by limited group of managers to come to final decisions. [PAT15] (Pratumtong, 2015)

Extensions for tools and processes based on the examples of IT projects

Due to the current development of the world and constant globalization the humanity has created and used a number of effective communication tools and techniques to integrate them into international project (Skype conferences, e-mails exchanges, etc.). Usually a team uses them to enhance the processes and quality of the product they are working on. Moreover, these tools are used during each and every project phase as they are mainly improving project communication.

What concerns creativity it is important to keep in mind is that tools and techniques do not enable people to be creative, but they make team members to think in a creative way. These tools don't help in generating new ideas from the very beginning of using them. It takes time to make the techniques work and insure efficient and effective way of thinking. Workwise, integration of techniques must be easy-going. Team members should not worry about rules and prescriptions of such tool. They must be open to new ideas without paying attention to any limits required to follow the techniques method.

People are usually not so keen on accepting various creativity tools. They would rather choose maximum two appropriate and convenient for them techniques, rather than jumping from one approach to another. Unfortunately, strict and direct application of creativity prescriptions described in PMBOK and other books will give little room to successful development of this creative tools as they extremely limit freedom of thinking. Project manager as a leader of the project must determine which creative communication tools are the most appropriate, effective and worth applying for the team based on the cultural customs and business rules of the industry. Communication as a skill often suggests solving various problems related to uncertainty. Moreover, communication with high emphasis of creativity is an accelerator of idea generation being an essential part of project organizing. Creativity helps the team to plan steps in resolving unforeseen and critical issues and may help in successful delivery of final product. When choosing the appropriate method of communications for each type of the information for each specific category of stakeholders, project manager should be mindful regarding the benefits and drawbacks specific for each of the communication methods.

2.5. Communications Management Matrix

As a probable tool to support and enhance project communication may be various different Matrix showing the set of meeting planned during the whole time of project duration. Basically Communications Management Matrix aim on keeping every team member informed about coming or just simply planned meeting events. Communications Management Matrix is presented as a table that describes the Communication process by showing on one hand the set of meeting planned and on the other hand different categories characterizing these meeting. Such characteristics as Objective of communication (Type of Meeting), Communication Vehicle, Frequency, Audience/Participants, Meeting Owner (Lead who are responsible for Agenda and organization of the meeting), Distribution Vehicle (that is used to share the meeting results).

COMMUNICATIONS MATRIX

Project Name:	Systems engineering
Project Manager Name:	John Tesla
Project Description:	FreeSearch is a project which deals with software engineering for embedded (mostly automotive) systems with major focus on embedded systems.

ID	Communicaton Vehicle	Target Audience	Description/Purpose	Frequency	Owner	Distribution Vehicle	Comments
1	wiki space + Confluence software	DO Project Team + EuroMPM team	description of all project-related information in one place	constantly	John Tesla	Confluence software	
3	bi-weekly status report/	DO Project Team + EuroMPM team	Communicate updated project status	bi-Weekly (on Fridays)	John Tesla	in person/ emails (meeting minutes)	
4	DEMO version	DO Project Team	Communicate updated project status	monthly (on Fridays)	John Tesla	in person/ emails (meeting minutes)	Current work done is presented to the work package partners team.
5	weekly status report (project plan development)	Asia Project Team + Asia MPM team	Communicate updated project status	Weekly (on Fridays)	Asia MPM team	in person/ emails (meeting minutes)	Meeting is required to create an update current project plan and add up more information regarding Asia team work.
6	International	Asia Project Team	Communicate updated general project status	bi-annually	Anja Kerz	in person/ emails (meeting minutes)	Each partner will prepare a publishing plan that will be coordinated on the project level as well.
7	Final Review	Free Search leads	Summarization of work done within the project	31/08/2017	Anja Kerz	In person	

Table 2. Communication Management Matrix [own source]

Using Matrix Project Manager can structure the feedback exchange process and communication procedure by helping each project member to be prepared to discuss urgent and related topics beforehand. Communication Matrix is recommended to update constantly according to the project changes.

2.6. Communication chain

Communication chain is a tool that usually used to show the dependencies of communication procedure between team members. It presents the chain or consistency of reports or talks between team members within organizational levels. For example, Communication Chains presents boss-performer relations by showing who must report to whom or to be consulted. Usually it is created by project manager to distribute communication activities within the team fairly and avoid “communication overload” of particular team member. If the team is not equally-skilled the most experienced members (for ex. Technical Team Leads, QA Team Leads) are being constantly questioned by other team members. As an example of Communication Chains the graph below is presented.

On the picture below the communication chain is splitted into 4 organizational levels:

1) the lowest – students’ support;

2) managers of work packages (part of the project);

3) top management (Project Manager);

4) project’s sponsors and upper top management.

Each team member is connected with others by communication vehicles, meaning the devises or meeting that they use to exchange ideas or feedbacks (e-mails, Skype Calls and Conferences, meetings in person, etc.). Moreover, the arrows show who is able/allowed to communicate with whom and provide with reports.

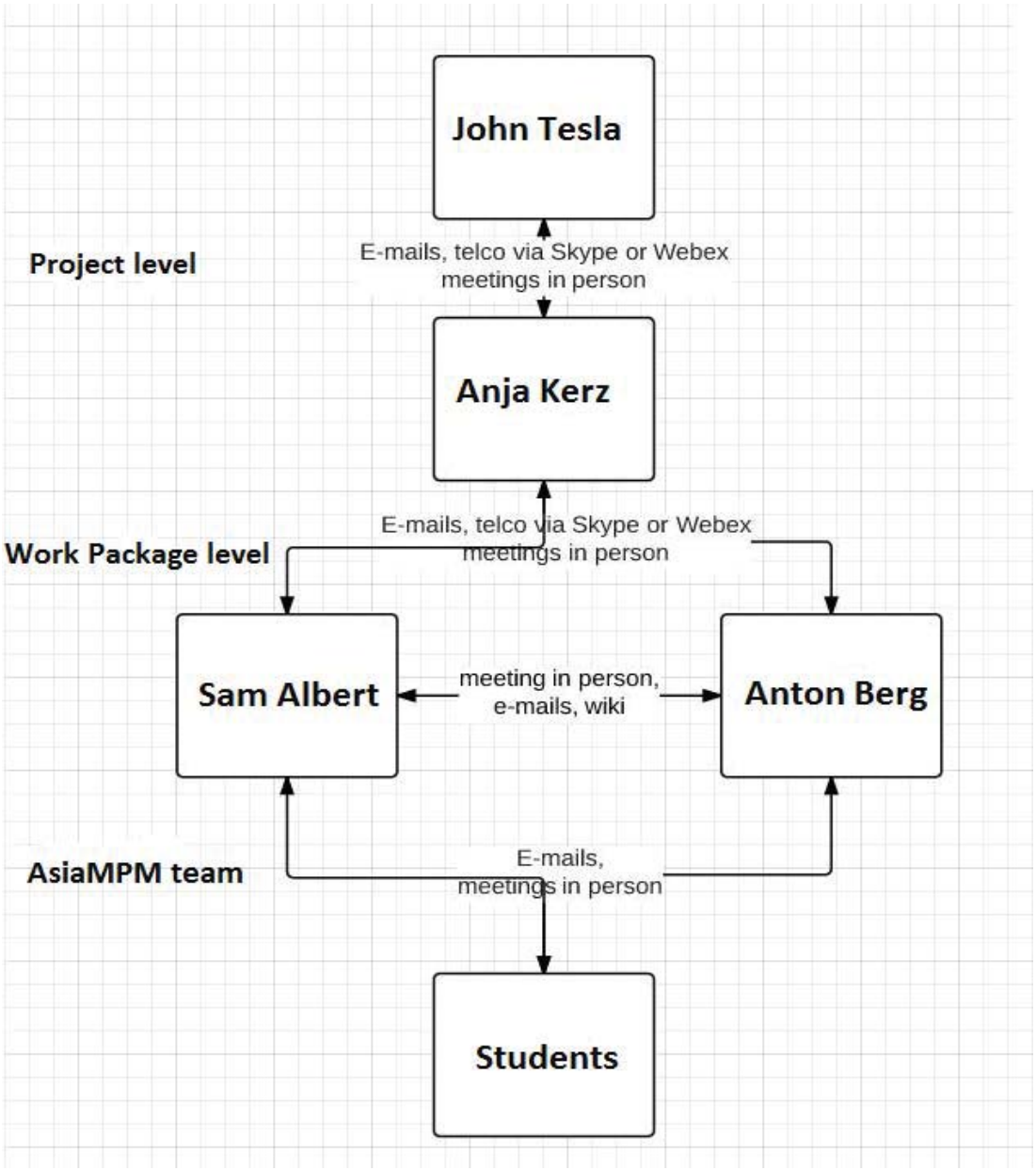

Figure 3. Communication Chain [own source]

3. Conclusions

To find all answers to the stated questions PMI's 2013 "Pulse of the Profession" research on the importance of effective communications was studies. The research showed that a startling 56 percent of the whole budget planned is at risk due to ineffective communications. Thus, companies are not able to create and manage strategic initiatives unless they are able productively communicate their strategic goals and business benefits. To construct and strengthen the theoretical basis of author's scientific work such books as PMBOK 5th Edition, "Effective Project Management: Traditional, Agile, Extreme" by Wysocki have been used. "Creative, Efficient,

and Effective Project Management" by Ralph L. Kliem was a supportive material to create solid vision concerning creativity tools and best practices that may be used in the project. Types of communication styles in different countries have been studied by author with help of an internet source such as http://worldbusinessculture.com/, where it has been possible to find detailed description of communication styles in a number of countries. Focus groups consisted of international managers and interview (on-line, phone, personal contact) of ex-colleagues from international IT companies have helped the author in doing analytic work.

The first chapter made an overview on the definition of communication and gave a hint on now to group and manage stakeholders in order to make the communication with them more efficient and beneficial for the project success. The chapter also discussed the strategies, methodologies and tools that should be used during the communication with stakeholders, as well as provides the main methods of communication, covered in PMBOK 2013 and creativity-related books. Here the grade with which creativity tools can accelerate communication in the team or organization was investigated. The number of meeting types and creativity techniques used during them were proposed to improve the communication aspect, as well as vital issues that might occur during the communication with stakeholders were discussed.

In the second chapter an information about styles and approached was given from the prospective of international environment. The focus here lied on the ways in which culture has been transformed by (among other things) the new communication technologies and how this technologies are transforming the culture. Communication habits and styles typical for such countries as the Germany, UK, India and Belarus were studied. As the culture of these very countries are different, the way in which their representatives are doing business and of course communicate is visibly different. Some hints how to structure communication process and what creative tools are most applicable in different countries were given.

Based on the information from previous chapters, the third chapter proposed the possible extensions for tools and processes in order to improve communication with stakeholders. Among the proposed tools were Communication Management Matrix and an example of Communication Chain diagram.

4. Bibliography

[ASH07] Ashalatha D., 2007. Concept of Communication. Department of HAS.

[BAB15] Babitskaya, Gelena. Personal Interview. 22 May 2015.

[DOW08] Dow B., Taylor B., 2008, Project Management Communications Bibl, Wiley Publishing Inc.

[HUB14] Hubert Knoblauch, 2014. Culture, Communication, and Creativity, Pl Academic Research, Oxford, UK.

[KLI14] Kliem, R. L., 2014. Creative, Efficient, and Effective Project Management. s.l.: CRC Press.

[OFF07] Office of Project Management Process Improvement 2007. Project Communication Handbook – Seconf Edition, Sacramento.

[OLI15] Oliver, John. Personal Interview. 25 May 2015.

[OSB63] Osborn, A. F., 1963. Applied imagination: Principles and procedures of creative problem solving. 3rd Ed. New York: Charles Scribner's Sons.

[PAT15] Pratumtong, Patcharee. Personal Interview. 26 May 2015.

[PMI13] Project Management Institute 2013. A Guide to the Project Management Body of Knowledge (PMBOK(R) Guide) - Fifth Edition, Pennsylvania.

[WB14] International Bank for Reconstruction and Development/The World Bank, 2014, "Doing Business 2014 -11th Edition", Washington.

[WYS11] Wysocki, R. 2011, Effective Project Management: Traditional, Agile, Extreme - Sixth Edition, New York.

Online resources:

[BBC15] BBC News, "BBC News Technology" (http://www.bbc.co.uk/, 2015).

[DCO11] Dcosta, A., 2011. Components of a PESTLE Analysis. [Online] Available at: http://www.brighthubpm.com/project-planning/51754-components-of-apestle-analysis/ [Accessed 2015].

[MIN15] MindTools, 2015. TRIZ. A Powerful Methodology for Creative Problem Solving, available from: http://www.mindtools.com/pages/article/newCT_92.htm/ [Accessed 2015].

[SHE14] Sheen R., 2014, Project Management Communication Tools & Techniques, available from: http://www.projectmanagementguru.com/communication.html [Accessed 2015].

[WBC15] World Business Cultures, 2015, BUSINESS CULTURE ON THE WORLD STAGE, available from: http://worldbusinessculture.com/ [Accessed 2015].

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ISBN 978-3-00-051908-6