

SYLLABUS - CME4701 CONTRACTOR MANAGEMENT SYSTEMS



MANAGEMENT SYSTEMS OF CONTRACTORS

STUDY LOAD

5 ECTS

EDUCATION PERIOD

Q4 - Start: April 2022

CONSTRUCTORS

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1. GENERAL INFORMATION

The **Contractor Management Systems (CMS)** course is about the way a contractor organizations manages **one-off construction projects** of infrastructure/real estate systems or delivers **ongoing operations and maintenance quality of services**, as outsourced contracts from services providers or other clients.

Contractors strive to manage their construction projects/service operation organization effectively and efficiently, supported by state of the art management systems. The organization can be triparted into a (1) cultural/ecological purpose, (2) product-service/economic operating model and (3) the organizational/socionomic support sub-system. The overall contractor’s identity is integrated by the interplay of these sub-systems into the so-called socio-eco purpose. The different characteristics of this view can be derived from organizational theory in which the organization is modeled as a living social organism (‘a living biotope’). The organization therefore changes over time as a learning and developing organization. In this she goes through different maturity levels: Pioneer-Expansion-Maturity and/or phases Pioneer-Differentiated-Integrated-Associative phases, including their relevant management & leadership styles

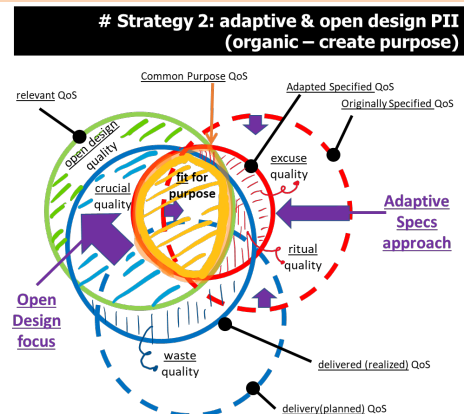
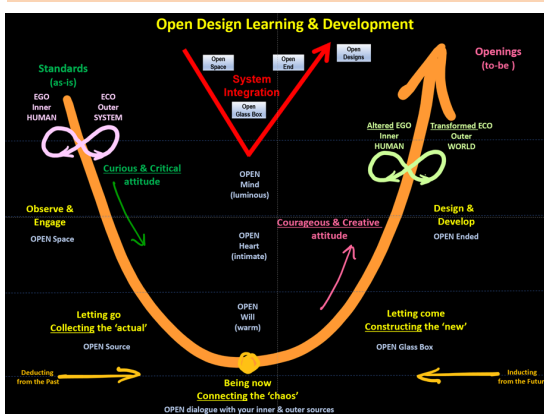
The predominant aspects of construction project management are money, organization, time, risks, information, quality, and safety: i.e., MOTRIQS. For a service operations contractor, these most important drivers are slightly modified into MOSRIQS (where the first S stands for quality of Service and the Q for process Quality). The nature of a construction project management organization is controlling its one-off project goals and deliverables, where the nature of a service operation organization is to care for the engineering assets by safeguarding their quality of services parameters (e.g. reliability, availability, maintainability, safety etc.).

Managing a contractor organization means taking different decisions because both project as well as service management are dynamic process on-the-run. For this PFM (preference function modeling) combined MCDA (multi criteria decision analysis) will be used to model and evaluate important managerial decision (e.g. a supplier selection, a construction logistics scenario etc.)

This course offers an alternative view on **contractor management** systems which integrates the management concept of double loop learning, as applied to organizational learning and development, into the management (styles) of construction projects where the contractor organization is seen as an organic living entity **fit for socio-eco purpose**. The course is structured along the **key project/service management dimensions MOTRIQS/MOSRIQS** (GOTRIK/GOSTRIK in Dutch), which read as Money, Organization, Time/Service, Risks, Information, Quality and Safety dimensions. Finally, these management systems will be improved and or justified using the Open Design principles: Open glass-box modelling, Open source multi-criteria stakeholders, Open ended systems theory combined with Open loops management.

The following concepts are being addressed following **the contractor’s viewpoint**:

1. Management Systems and the PMS - Project & Construction Management System (and OMS – Operations & Maintenance Service Management system).
2. Construction project planning & mitigation control (and 3C asset QoS optimization)
3. Multi-criteria managerial decision making (MCDA & PFM)
4. Fit for purpose Quality management
5. Information systems – the BIMSI concept
6. The developing contractor organization - a living enterprise for the future
7. Associative co-makers and the supply chain



1.1. The education concept: Open Design Learning (ODL)

The Open Design Learning concept (ODLc) is an innovative educational concept for higher education. It is a reflective, creative and engaged learning approach that opens human development and unlocks new knowledge and solutions. ODLc stimulates students' curiosity, clarity and creativity. ODLc teachers and students are working in an open spirit levelling relation.

The ODL approach connects the inner personal learning ego and the outer real world eco. ODL integrates the student's learning and development via the U-model with the engineering system development via the V-model. Here the U-model constitutes experiential learning with an open mind, open heart, and open will design approach. The V-model represents an engineering system development process from an open-source, open-ended, and open glass-box modeling design approach. So in other words, the ODL teaching concepts integrates experiential and design based learning.

The students and the teachers cooperate in a living dialogue in- and on-action. This co-reflective dialogue creates an open space where alternative views can co-exist and new insights can be conceived. Students learn via a self-chosen system of interest arriving at an original response demonstrating their individual learning achievements.

The ODLc forms the fundamental basis for creating 'open, integrative and persistent learners' concerned about solving future world problems. For more information on Open Design Learning (ODL) and it's concepts, see: www.open-design.school.

For this course the ODLc is implemented as follows. Every week students are asked to study specific concepts and apply these to their self-chosen Contractor of Interest (CoI) by means of a self-created response and related open-glass-box (computer) models. The CoI serves as the main learning vehicle for applying all course concepts. The teachers incite the CMS concepts as a reflective practitioner using both reference books and dialogue questions from the students. The students have 2 hours of these concept and dialogue sessions and 4 hours of reflective (computer) work sessions per week for a number of weeks. During the work sessions, students can work on their ODL response under supervision of the teacher/constructor. On top of this, masterclasses are used where students and constructors co-reflect on a group's concept translation.

In this course, the 'deep' U-approach will be based on front-loading the incitements and concepts over 1st half of the course, the first 5 weeks (including the self-chosen choice of a CoI) and construction and co-transforming during practical works and masterclass sessions over the remaining 3-5 weeks (2nd half of the 10 weeks period).

After this course students should be able to:

- understand and be familiarized with CMS concepts, principles and practices, by dialoguing these with the constructors, by navigating through the CMS reference books and by engaging to the CoI.
- apply and relate these abstract CMS concepts, by dialoguing and experiencing these with the CoI and reflective practitioners.
- (re)work this CMS knowledge, by transforming and linking the CoI-dialogues into new insights.
- demonstrate and develop the personal outcome of the aforementioned learning goals, by internalizing the openings/ learning achievements in an original ODL response.

1.2. Concept & introduction: Incitement sessions

The concept sessions (2 hours p. week) start with a dialogue part where the teachers go over the different dialogue questions that emerged during the practical meeting of the previous week. Dialogue questions are questions that are general and of interest for all students (not necessarily linked to an individual CoI). The second part of these sessions are about introducing the new concepts. Each new concept needs to be translated and transformed towards the CoI. These concept sessions are being organized by the constructors (overall responsible teachers).

Note: only during the Dialogue part the teachers will reflect on/ answer student's questions.

1.3. Transformation & Reflection (1): Practical work session

The practical work sessions takes place each week (**2 hours**). First week's practical work session is about discussing and motivating your Col with your teachers to make sure that it is suitable as a learning vehicle. The remaining sessions students can work on their **ODL poster response** under supervision of different constructors/ reflective practitioners. The goal is to transform the different concepts to the each group's Col. Students can receive individual feedback on their open glass-box models and or logical reviews. The ODL poster response is a demonstrator to discuss your work in progress.

Note: only during the Practical sessions the teachers will reflect on/ answer student's questions.

1.4. Reflection (2): Masterclass

A masterclass (MC) is a short event in which a selection of groups share their ODL poster response in progress (WiP) followed by feedback from the teachers. There is no formal evaluation. The goal of a MC is to identify a group's issues, problems, ideas and opportunities that mostly also apply to other groups.

We have experienced that masterclasses are found very useful, both by the students who share their work and by the listening students. For this course two masterclass events are planned.

1.5. Learning vehicle: a self-chosen Contractor of Interest (Col)

At the start of this course **groups of 2** must be formed and each group must choose a Construction Project Contractor or a Service Operations Contractor of Interest (Col), a self-chosen project/service contractor (consortium) that either (1) currently delivers a construction project (or recently has been constructed, preferably no longer than 6 months ago) or (2) operates & maintains a set of engineering assets (subcontracted by a service provider)¹. Groups who will go for this second option (the service contractor) will receive maximum 1 **bonus point** (on the commendation scale of 10).

In order to be able to convert all course concepts it is important that the Col meets the following criteria:

- The students are able to retrieve Col related information both from different sources of media and from involved practitioners (i.e., **ensure a direct human contact within your Col that you can contact on a regular basis**).
- As part of your organizational analysis we recommend you to organize at least **one interview** with the Col's project manager. The reflective practitioner from the construction management can serve as the contact for arranging this interview.
- You need to be able to get hold of the **project construction schedule** (GANTT chart, MS Project / Primavera) as part of the project delivery plan (PDP) – construction project contractor;
- Or you should be able to get the **operations and maintenance** schedule as part of the service operations plan (SOP) – operations and maintenance service contractor

The **Col and your group motivation** must be approved by the teachers via upload on Brightspace. The first practical session allows you to discuss the Col with the teachers. Approval is based on a short document that you upload latest **29 April** (end of week 2). This proposal contains a concise motivated description of your Col, how you are connected and how you plan to obtain the required information (max.1 A4). Only those groups whose Cols are not approved will be notified not later than **4 May** (mid week 3).

1.6. Deliverable: the ODL response

The deliverable of this course is the so-called Open Design learning response. This ODL response is a group deliverable based on the self-chosen Col (one group delivers one ODL response).

¹ In NL, a typical well-known construction project is the Afsluitdijk contracted by BAM/vOord. In NL, a typical performance based service contract is contracted by VolkerRail on behalf of the service provider ProRail.

The Open Design Learning (ODL) response is an original enabler demonstrating both the group and personal learning and development achievements. For this CMS course, all of these (incl. a link to the open glass box model) should be presented **in a poster format (minimal size A1= min. 8*A4)**. This **ODL poster response** illustrates how the general concepts have been linked and evaluated to the self-chosen CoI using a: 1) logical diagram and/or 2) computer model(s). All of these computer models should be presented as an Appendix the ODL poster response.

Some hints for finalizing your response:

- Use a management summary format that already catches the imagination of its ‘beholder’.
- Take care of your response’s signal to noise ratio. For each piece of information, ask yourself: would it hurt the line of reasoning if I left it out? Usually less is more. Note: the response is not a day to day report of what you have done.
- Don’t assume that the information density correlates with the final grade. In our experience usually the opposite holds as it takes much time to end with the most agile line of reasoning.
- Your final response can be achieved by backwards engineering. After you have translated all concepts you will have enough of an overview to put all parts together into a coherent and well-structured response.
- Do not repeat what is in the reference material. Your text will be unique because you used reference material to link it to your CoI.
- Only use references that support your line of reasoning.

Students should demonstrate how and/or if these concepts are being utilized and the rationale behind its specific use(fullness). **The final ODL response needs to be handed in no later than 24 June (end week 10).**

1.7. Judgment & Reflection (3): the ODL commendation

The Open Design Learning commendation principle will be applied as a grading rubric for the ODL response. Both the CoI content characteristics, and the student’s learning process are integrated within these commendation principles.

We call it ‘commendation’ because when we grade your response, we start from a grade of 10 and only deduct points if aspects are missing/only partially worked out.

Commendation Category	Relates to:	Expressed in (the making of) the ODL response:
Connect	Learning process	Showing courage, being curious, being a creative problem solver. Engagement factor.
Construct	Model / concept transformation, improvement proposals and verification	Showing proper concept conversion, conceptions for improvements, correctness in modeling. Going the extra mile in concept conversion. Content factor.
Conclude& Conspct	Developed results, validation and reflection	Showing a cyclical approach, dealing with completeness, conspection of own work. Overview factor.
Convey	Reporting and presenting the response	Showing a clear line of reasoning. Being concise (signal to noise ratio). Not copying reference material. Straightforward factor.
Convince	Response speaking to / arousing the imagination	Being cogent and demonstrating a critical attitude. Compelling factor.

After handing in the ODL response your will receive your grade. To pass the course your ODL commendation grade should be higher than or equal to 6. After commending your ODL response **one plenary open dialogue session** (max. 2 hours, somewhere between **week 12 and 14** to be announced) with one of the constructors

will be scheduled. Only during this session(s) we can reflect on your ODL response: bear in mind, the outcome of this reflection can result in a lower/equal/higher grade.

- If your grade is higher than or equal to 6 you can learn the rationale behind this commendation. This does not mean that you can use the provided feedback to improve your response and re-upload to get a higher grade.
- If your grade is below a 6 you will receive (prior to the session) a constructive and written proposal for improving your ODL response with a specific deadline. During the aforementioned session you can discuss this proposal in more detail on how to update your ODL response which will be commended with a maximum grade of 6.

WEEKLY COURSE CONTENT: THE ODL CONCEPTS

The course consists of two meetings for most weeks: 1) an incitement session (IS) and 2) a reflection and practical work session (PW).

Week	Session	Concept	Topic	Constructor	ODL activity / product
1	IS ① TUE 19 April 15:45 - 17:30	Management System (PMS or OMS) and Systems Integration. – C#1	<ul style="list-style-type: none"> project management as a dynamic development system (open source technical sub-system) = product + process Systems Integration: from functional requirements to functioning system FBS/SBS/WBS/RBS design of a organization system linked with the V-model, OBS viewpoints discipline/object/geography (interfaces). managing the contractor organization effectivity/efficiency (T,G,K,I),R,O = GOTRIK = MOTRIQS for Project Delivery or MOSTRIQS for Service Operation), 	RW, RB	<ul style="list-style-type: none"> Students form groups of 2. Students enroll for a group on Brightspace. Students start search for self-chosen Col. Model/appraise the technical sub-system (economics) Model/ appraise the PMS and reflect on the mapping on the ISO 15288 design criteria
	PW ① THU 21 April 15:45 - 17:30		<ul style="list-style-type: none"> Translating concept into your Col, work on your ODL response and co-reflect with teachers. 	RW, RB	<ul style="list-style-type: none"> Search for a suitable Col.
2*	IS ② TUE 26 April 13:45 – 15:30	Construction Project planning & mitigation control. (T,M,R) – C#2	<ul style="list-style-type: none"> deterministic vs probabilistic planning (PERT) critical path ranking the mitigation controller as a model of the project manager’s goal-oriented behavior incorporation of mitigations on the run, to dynamically control risks and uncertainties Introduction software tool the MitC 	RW, RB	<ul style="list-style-type: none"> Get familiarized with TETRA and MitC Organize the Col’s project planning (on-the run) Model a typical management decision of for a suitable Col.
	PW ② THU 28 April 15:45 – 17:30	Multi-criteria managerial decision making. (I) – C#3	<ul style="list-style-type: none"> decision / utility theory, preference function modeling, correct scaling of preference, decision modeling Introduction software tool TETRA 	RW, RB	<ul style="list-style-type: none"> Upload Col proposal.
3*	IS ③ TUE 3 May 10:45 – 12:30	Fit(ness) for Purpose Quality management (Q) – C#4	<ul style="list-style-type: none"> Conscious products & service quality management and the quality handling circles verification vs. validation, GERT vs PERT Process quality control Systems Integration and Production (ISO15504/15288). 	RW, RB	<ul style="list-style-type: none"> Model/appraise the systems integration approach and fit for purpose functioning system Model/reflect on the information landscape (ICT) of the Col
		Conscious information management - and the BIMSI perspective (I) – C#5	<ul style="list-style-type: none"> relevant information vs big data within the mapping of management information used by reflective practitioner i.e. primavera/relatics/etc 		
	THU 5 May		<i>No practical, liberation day.</i>		
4	IS ④ TUE 10 May 10:45 – 12:30	Fit for socio-eco purpose project management (O) – C#6	<ul style="list-style-type: none"> project management as a living social organism (open-ended socio sub-systems) = people fit for socio-eco purpose (open design cultural sub-system) determining the contractor’s true identity technocracy/bureaucracy vs. adhocracy, structure in fives 	RW, RB	<ul style="list-style-type: none"> Model/appraise the socio sub-system (socioeconomics) Model/appraise the socio sub-system (ecologics) Model/ quantify the socio-eco purpose of the organization (the true identity) Appraise the organizational development phase, incl. an maturity scan using the ISO 15504 system life cycle process assessment model. Determine the management style of the PMO Determine the degree of horizontal versus vertical steering Model/appraise the supply chain and its impact of the project performance
		The contractor organization learning & development and management styles. (O) – C#7	<ul style="list-style-type: none"> development phases measuring maturity levels (capability levels) double loop learning, PI/PIL, management styles/behavior linked with SCRUM and/or lean construction ego-centric vs. eco-centric, horizontal steering (cathedral/bazaar) 		
		The contractor’s supply chain and its co-makers (O) – C#8	<ul style="list-style-type: none"> synthesis vs compromise, pain/gain sharing, power game preferred sub-contractor/co- 		

			maker/partnering/associative cooperation, output oriented vs time oriented		
	THU 12 May 15:45 – 17:30		• ODL response Self-learning/working		• Integrating new concepts in your ODL response.
5	TUE 17 May 10:45 – 12:30	ODL response development	• ODL response Self-learning/working.		
	MC ① THU 19 May 14:00 – 17:30		• Translating concepts into your Col, work on your ODL response and co-reflect with teachers. Possibility to discuss WIP posters.	RW, RB	• Presenting ODL response WIP
6	PW ③ TUE 24 May 10:45 – 12:30	Conspexion	• Dialogue session based on WIP ODL response (only based on delivered DQs)		• Dialogue on general questions
	THU 26 May		<i>No practical, ascension day.</i>		
7	TUE 31 May 10:45 – 12:30	ODL response development	• Self-learning/working.		
	PW ④ THU 28 April 15:45 – 17:30		• Translating concepts into your Col, work on your ODL response and co-reflect with teachers.	RW, RB	• Demonstrate WIP posters • Integrating new concepts in your ODL response.
8	MC ② THU 2 June 14:00 – 17:30		MC Col discussions using selected group's ODL response poster minimal A1 size.	RW, RB	• Presenting ODL response WIP
10	FRI 24 June				• Upload your ODL response poster and your ODL Appendices. Hand in printed poster.

In the following sections practical guidelines are given for the different concepts.

Concept 1: Management Systems (PMS or OMS)

Projects and or service have a purpose that most likely originates from societal and user needs. These needs define the required quality that can be translated into required functionality of the not yet existing engineering artifact. The required functionality can be broken down into a Functional Breakdown Structure (FBS). The to be constructed engineering artifact that needs to be built as a 'functioning' response to the societal needs can be broken down into a System Breakdown structure (SBS). The SBS and other facilitating breakdown structures (e.g. PBS, RBS, PAM) can be used as a basis for a Work Breakdown Structure (WBS), that is the 'holy grail' of the project management. Breakdown structures can introduce interfaces that need to be addressed properly as the total scope of work can be divided over disciplines/objects/geographical location/environment. For the service contractor the SAM (project activity model) and the QoS/Cat A-B availability requirements will be discussed. Contractors strive to manage their project/service organization effectively and efficiently. The generic management part of the organization focuses on the cultural/ecological purpose, product-service/economic operating model or on the organizational/socionomic support sub-system of the organization. The aspects of organization (development) and information (provision) are the most important MOTRIQS dimensional drivers here. In the primary construction/production part of the organization, read the technical/economic sub-system, the (sub) project managers normally focus their attention on: time, money, quality, risks and safety (the other aspects of MOTRIQS). In simple construction projects, management tends to focus not so much on quality but mainly on how to avoid overruns in time and money. For a service operations contractor, the most important drivers are slightly modified into MOSRIQS (where the first S stands for quality of Service and the Q for process quality).

In addition to these work breakdown structures, the construction project management system uses a (project) management system for a controlled and uniform way of working. Such a PMS describes the processes, tools and instructions about how the organization will work. Finally, the organizational design (OBS) is both linked to both the WBS and the PMS. For this last part, a mapping is often made on the ISO 15288 system life cycle processes.

Required for translating this concept: Retrieve the FBS/SBS/WBS/RBS/etc. and nominate your group's contractor/project and reflective practitioner.

Reference material:

- Chapter 1 of L.A. Van Gunsteren, Stakeholder-oriented Project Management: Tools and Concepts 2011.

- Part I of Friedrich Glasl. *The Enterprise of the Future: Moral Intuition in Leadership and Organisational Development (Social Ecology)*, 1997
- ISO/IEC 15288 IEEE Std 15288-2008 2nd edition *Systems engineering —System life cycle processes (Brightspace)*
- *Guideline for Systems Engineering within the civil engineering sector. Version 3*

Concept 2: Construction Project planning & mitigation control

Probabilistic network planning is of limited use for managerial day-to-day decision-making. It is often only used 'to keep the board satisfied', by answering their inevitable questions about 'The Critical Path'. Actually, there is no such thing as a Critical Path, as will become apparent from this lecture. We pinpoint the fundamental error in all current planning models: The implicit assumption that execution will take place as indicated by the planning software. In other words, that the project manager will sit down with his arms crossed and do nothing when things do not evolve as planned. In practice, however, he works his head off to correct things that do not proceed as planned. He takes all kind of measures – mitigations – to ensure that the target completion date of the project is achieved in spite of numerous things that do not develop according to plan. In short, planning software that does not account for mitigations on the run may be useful for control, but is unsuited for the (weekly) scheduling of activities. To correct this fundamental error, we developed a probabilistic network methodology enabling mitigations on the run to be taken into account.

Required for translating this concept: Retrieve project schedule or subset, suggest mitigation measures, run MitC software to identify probability of timely completion. If you have chosen a service Col, then you should retrieve the operations and maintenance schedule as part of the service operations plan (SOP). In that case you have to develop a 3C based O&M optimization tool (this is one of the reasons why you will receive a bonus for this).

Reference material:

- Chapter 4 of L.A. Van Gunsteren, *Stakeholder-oriented Project Management: Tools and Concepts 2011*
- Kammouh, Omar ; Nogal, Maria ; Binnekamp, Ruud ; Wolfert, A.R.M. (Rogier) / Mitigation Controller : Adaptive Simulation Approach for Planning Control Measures in Large Construction Projects. In: *Journal of Construction Engineering and Management*. 2021 ; Vol. 147, No. 8.
- Kammouh, Omar ; Kok, M. W.A.(Maurits) ; Nogal, Maria ; Binnekamp, Ruud ; Wolfert, A. R.M.(Rogier). / MitC : Open-source software for construction project control and delay mitigation. In: *SoftwareX*. 2022 ; Vol. 18.

Concept 3: Multi-criteria managerial decision making

Managing a contractor organization means taking different decisions because both project as well as service management are dynamic process on-the-run. Choice is synonymous to preference as we choose those objects that we prefer. Classical methods for measuring preference lack a sound mathematical foundation which renders them useless. A new methodology for measuring preference called Preference Function Modeling (PFM) is based on a sound mathematical foundation. It not only allows for proper measurement using proper scales, but also for proper aggregation of preference ratings on different criteria. In this chapter, a software tool* is offered for this purpose, based on the theory of PFM.

Required for translating this concept: Select (an) important management decision(s), model this decision using PFM software, perform a sensitivity analysis. If you will be able to model a typical conflict of interest, by using the a-priori Preferendus approach (from the course CME 4481) you will receive maximum 1 bonus point.

Source material:

- Chapter 5 of L.A. Van Gunsteren, *Stakeholder-oriented Project Management: Tools and Concepts 2011*
- Jonathan Barzilai, "Preference Function Modeling: The Mathematical Foundations of Decision Theory," in *Trends in Multiple Criteria Decision Analysis*, Matthias Ehrgott, José Rui Figueira, and Salvatore Greco (Eds.), Springer, pp. 57–86, 2010.

https://scientificmetrics.com/downloads/publications/Barzilai_2009_MCDM.pdf

Concept 4: Fit(ness) for purpose Quality management

The main focus for both complex construction projects and service operation is to focus on fit/ fitness for purpose quality, rather than focusing on compliance with specifications (excuse quality). The quality concept is introduced as a fair balancing act between demand (wanted) and supply (made/ offered) resulting in best fit(ness) for Common purpose, between Client & Contractor. The focus on getting the project/service delivery in line with fit(ness) for purpose is supported by a classification of different categories of quality, summarized within the so-called quality circles model. Two main Quality management approaches are being elucidated (linked to P/M I-II approaches). Finally also the concept of process quality during the execution of contracting activities is introduced using the capability levels from the ISO 15504.

Required for translating this concept: Use the proposed classification to identify different categories of quality that are/were applicable to your Col and find out if these were exchanged to get execution in line with (fit)ness for purpose. Apply the quality circles model and use typical (design and or execution) contractual changes originated by the client or the contractor. Determine the process quality capability levels using the ISO 15504..

Reference material:

- Chapter 6 of L.A. Van Gunsteren, Stakeholder-oriented Project Management: Tools and Concepts 2011 and the adapted Quality circles model from the lecture slides.
- ISO/IEC 15504-2/6 2013 1st edition Measurement Framework for Process Capability/ An exemplar system life cycle process assessment model

Concept 5: Conscious Information systems – and the BIMSI concept

Stakeholder-oriented management can only be effective when decisions are based on relevant information. As this information is not readily available, the project/service managers have to find their own ways to get hold of this and other relevant information that is fit for purpose. On the other hand, the project manager tends to be flooded with a stream of, actually less relevant, information contained in standard reports on costs, progress, claims, etc. A classification of types of information and the information circles model are introduced to help understand the managerial information systems in use by the contractor. Moreover, the building information and systems integration (BIMSI) is elucidated (in line with the CME4120 course).

Required for translating this concept: Retrieve management information system, information landscape/architecture, nominate reflective practitioner, model his relevant/used/confusion mapping of his management info into the information circles model.

Reference material:

- Wolfert, Nederveen, Binnekamp (2022) Fit for purpose Building Information Modelling and Systems Integration (BIMSI) for Better Construction Projects Management, J. of Modern Project Management (JMPM) DOI NUMBER: 1019255/JMPM029011
- Chapter 6 of L.A. Van Gunsteren, Stakeholder-oriented Project Management: Tools and Concepts 2011 and the adapted Information circles model from the lecture slides

Concept 6: The developing contractor organization - a living socio-eco enterprise for the future

The Col is part of a larger main contractor organization (e.g. VolkerRail is part of VolkerWessel). A main contractor organization is an open, living and dynamical system that can be triparted into a (1) cultural/ecological purpose, (2) product-service/economic operating model and (3) the organizational/socionomic support sub-system. The overall contractor's identity is integrated by the interplay of these sub-systems into the so-called socio-eco purpose. The different characteristics of this view can be

derived from organizational theory in which the organization is modeled as a living social organism ('a living biotope'). The organization therefore changes over time as a learning and developing organization. In this she goes through different maturity levels: Pioneer-Expansion-Maturity and/or phases Pioneer-Differentiated-Integrated-Associative phases, including their relevant management & leadership styles. To objectively determine the organizational (primarily the technical sub-system quality) maturity the so-called capability levels from the ISO 15504 could be used. The generic management part of the organization focuses on the cultural/ecological or on the social/socioeconomic sub-system of the organization. The overall identity is integrated by the interplay of these sub-systems into the so-called socio-eco project's purpose. The different characteristics of this view can be derived from organizational theory in which the organization is modeled as a social organism (i.e., living system).

Required for translating this concept: Retrieve the organizational make-up/identity and appraise of the true socio-eco purpose contractor identity by using the Socio-eco purpose characteristics – Table I. Determine the main elements of the Contractor's identity, describe the main elements of both the organizational structure and the contractor's operating model. Appraise the predominant developing phase of the main contractor's organization, according to Table II. Appraise the type of organization according to Mintzberg's 7 organizational configurations characteristics – Table III.

Reference material:

- Friedrich Glasl. The Enterprise of the Future: Moral Intuition in Leadership and Organizational Development (Social Ecology), 1997
- ISO/IEC 15504-2/6 2013 1st edition Measurement Framework for Process Capability/ An exemplar system life cycle process assessment model

In this concept we also summarize best practice management styles for managing complex projects as can be derived from ODL and double loop learning (P/M I or II), R&D management practice, lean construction, horizontal leadership and or other relevant practices. For the specific application to project management we use the concept of PI/PII management styles, fit for simple/complex projects. For a service contractor these management styles are MI/MII (see course CME4300).

Required for translating this concept: Classify the organizational management style via an interview with your reflective practitioner using MI/MII or PI/PII – Table IV, including a vertical and horizontal leadership style appraisal.

Reference material:

- Chapter 2 and 3 of L.A. Van Gunsteren, Stakeholder-oriented Project Management: Tools and Concepts 2011
- Horizontal leadership and self-steering teams. a path to a healthy development of the company. <https://het-imo.net/wp-content/uploads/2021/07/Horizontal-Leadership-and-Selfsteering-Teams-1.pdf>

Concept 7: The supply chain and its co-makers

The contractor management style closely relates to the project's and or service partner landscape and how all these partners collaborate. Associative forms of collaboration allow for dealing with unforeseen changes during execution and relate to the subjects of synthesis and compromise, pain and gain sharing, co-creation, partnering, output-oriented vs. time-oriented collaboration.

Required for translating this concept: Retrieve partner landscape and sub-contractors, take critical subcontractor, analyze the main contract mechanisms and make suggestions for improvement.

Reference material:

- Chapter 2 and 7 of L.A. Van Gunsteren, Stakeholder-oriented Project Management: Tools and Concepts 2011

- Video on organizational architecture for service provisioning by Jos de Blok I (Self) Organisation with or without management : <https://www.youtube.com/watch?v=EE8t6FUfeVk>

2. OVERALL REFERENCE MATERIAL

The following reference books are recommended:

- L.A. Van Gunsteren, Stakeholder-oriented Project Management: Tools and Concepts 2011
- Friedrich Glasl. The Enterprise of the Future: Moral Intuition in Leadership and Organizational Development (Social Ecology), 1997

Scientific reference articles:

- Kammouh, Omar ; Nogal, Maria ; Binnekamp, Ruud ; Wolfert, A.R.M. Rogier. / Mitigation Controller : Adaptive Simulation Approach for Planning Control Measures in Large Construction Projects. In: Journal of Construction Engineering and Management. 2021 ; Vol. 147, No. 8.
- Kammouh, Omar ; Kok, M. W.A.(Maurits) ; Nogal, Maria ; Binnekamp, Ruud ; Wolfert, A. R.M.(Rogier). / MitC : Open-source software for construction project control and delay mitigation. In: SoftwareX. 2022 ; Vol. 18.
- Wolfert, Nederveen , Binnekamp (2022) Fit for purpose Building Information Modelling and Systems Integration (BIMSI) for Better Construction Projects Management, J. of Modern Project Management (JMPM) DOI NUMBER: 1019255/JMPM029011
- Kammouh, O., Nogal, M., Binnekamp, R., & Wolfert, A. R. M. R. (2021). Multi-system intervention optimization for interdependent infrastructure. Automation in Construction, 127, 1-11. [103698]. <https://doi.org/10.1016/j.autcon.2021.103698>

Additional reference books per topic:

- Wayne J. Del Pico, Project Control - Integrating Cost and Schedule in Construction, RSMMeans 2013
- Frank Harris, Ronald McCaffer, Modern Construction Management 2013
- Henry Mintzberg, Structure in fives: designing effective organizations 1992
- Chris Argyris and Donald Schon, Organizational Learning II, 1996
- Graham Winch, Managing Construction Projects, Wiley Blackwell 2015
- Nigel Slack (2006). Operations Management (5th edition). Prentice-Hall.

Industrial systems engineering standards and others:

- ISO/IEC 15288 IEEE Std 2008 2nd edition Systems engineering —System life cycle processes (Brightspace)
- ISO/IEC 15504-2/6 2013 1st edition Measurement Framework for Process Capability/ An exemplar system life cycle process assessment model
- Guideline for Systems Engineering within the civil engineering sector. Version 3 https://www.leidraadse.nl/assets/files/downloads/LeidraadSE/V3_EN/boek_Leidraad_SE_ENG_3_72dpi-def.pdf
- Theory on the Purpose Economy: <https://purpose-economy.org/en/>
- 'Improve the world – start together. The social main law'. Lectures by Dr. Rudolf Steiner (GA34 and GA54 from <https://www.rsarchive.org/>). The Dutch translation:“ Pentagon. The Dutch translation:“Verbeter de wereld (en begin samen) – de Sociale Hoofdwet”, ISBN 90-73310-60-1 Uitgeverij Nearchus.
- Video on social threefolding from the Hespurus village (Canada) entitled : Three Fold Social Order & Sociocracy : <https://www.youtube.com/watch?v=6hEDbDdG1XM>