Innovations in practice

The nineteen bachelor's degree programmes of the University of Twente have recently had a drastic make-over. How does one guide such a far-reaching change process? After a comprehensive review of the literature the university developed so-called Maturity Models. 'Despite, or maybe because of their simplicity these are powerful instruments, that have a deeper ground than what catches the eye'.

Tailor-made Maturity Models for transformational change in HE
The implementation of the Twente Educational Model

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On September 2, 2013 close to 1,600 new students entered the bachelor's programmes of the University of Twente in The Netherlands. It was not the number of students but the fact that they all enrolled in fully redesigned bachelor programmes that made this a landmark event. That year, the University of Twente started with the implementation of a new educational model, under the acronym TEM (Twente Educational Model). Box 1 shows the profile of our university. Box 2 describes the change.

Box 1 – Profile of the University of Twente	
Location:	City of Enschede, The Netherlands
Founded:	1961
Profile	Entrepreneurial research campus university. Research, innovation, new technology. Combining power of Science, engineering and behavioral and societal sciences. ('High Tech, Human Touch').
Number of employees (fte)	2,700
Number of students (total)	9,500
% students of non-Dutch nationality	23.1
Degree types	BSc, MSc, PDEng, PhD
No. of Bachelor programmes	19 Advanced Technology; Applied Physics; Biomedical Technology; Business & IT; International Business Administration; Chemical Engineering; European Studies; Civil Engineering; Communication Science; Creative Technology; Educational Sciences (to be phased out); Electrical Engineering; Health Sciences; Industrial Design Engineering; Mechanical Engineering; Psychology; Technical Business Administration; Technical Informatics; Technical Mathematics; Technical Medicine.
No. of Master programmes	35
University College	Yes: Engineering University College ATLAS (Academy of Technology and Liberal Arts & Sciences)
Other	Twente Graduate School and other excellence initiatives
Faculties	5
Federated with	TU Delft and TU Eindhoven in 3TU (three technical Universities)
Consorted in	ECIU; EUA; CESAER
Research institutes	4 (including nanotech: MESA+)
Income	€ 322m (in 2013)
More info	http://www.utwente.nl/en/

Box 2 – Transformation at a glance, TEM (Twente Educational Model)	
Scope	All bachelor degree programs
Goals	Improve study speed; reduce and concentrate drop-out; reduce costs by 10%; improve educational quality; enhance attractiveness and competitiveness
Key elements	High Tech, Human Touch and introducing three student roles (researcher, designer, organiser) plus entrepreneurial attitude. Transition from course-based to module-based curricula; project-led education; focus on 21st century skills
Change strategy	Change-over from initial top-down to bottom-up. Big bang, after two years of piloting with two programmes
Key actors	Rector Magnificus (similar to a Vice-Chancellor) as vision and change leader. A central, small and dedicated team, a new dean position filled for this and other educational projects and one educations director assigned per faculty as primus inter pares of the educational directors
Change tactics	Framework guidance, many meetings and discussions, carousels to share good practices, training programmes and dedicated evaluations and monitoring

There were two main drivers for this transformation. The first was the key focus on innovation and improvement of our education, led by the Rector Magnificus prof. dr. H. Brinksma who was appointed on January 1, 2009 (Gommer et al.). The aim was to enhance the quality of the learning experience and the learning environment by not having the teacher but the student at the centre. Learner-Centered Teaching (e.g. Weimer, 2002) is an important principle underlying 'TEM'.

The second driver was that the Dutch government issued new guidelines for all Dutch universities. The focus came to be on improving study yields – while simultaneously lowering budgets as a reaction to the economic downturn and subsequent budget cuts. To reach these study yields the University of Twente has modularised its programmes. In a module, teaching and learning is offered thematically and integrated; students are activated to study full-time and to obtain 15 European Credits per quartile in one go.

As shown in boxes 1 and 2 the implementation of 'TEM' is about redesigning our full spectrum of bachelor's degree programs – ranging e.g. from Psychology on the one end to e.g. Technical Mathematics on the other. This entails a transformational change: a deliberate and deep change in the culture of our institution. This transformation is omnipresent and touches the entire institution (Kezar & Eckel, 2002). A change like this is far from easy, especially in a university (Brown, 2013; Julius, Baldridge & Pfeffer, 1999; Kezar, 2001; Sleegers & Leithwood, 2010). That is a complex, ambiguous and political organisation with complex decision-making and highly qualified staff. The sheer size and focus of the change require change strategies, tactics and tools need to support a variety of disciplines and a variety of teaching staff as well. This was an important criterion for the type of instruments that we have developed and still are using: *Maturity Models*.

Unattainable ideal image

A Maturity Model looks like a simple table and should be simple to use. Despite, or as a result of, this simplicity it is a powerful instrument, which has more than meets the eye at a first glance. Such a model offers a set of functions, characteristics or competences which an organisation – or a part thereof – must have to function well. For each of these properties the development to the ultimate optimal level is described. Thus, each column renders a phase of development per aspect, whereas each row shows which four or five phases each property must progress through. The final phase can depict an ideal image which by definition is unattainable. The beauty of Maturity Models is in the contents of the cells: each phase should logically follow previous ones and all aspects within a phase need to be mutually congruent.

A Maturity Model looks like a simple table and should be simple to use

> *A teacher who views her/himself as authority, creates dependence of students*

The term 'Maturity Model' reminds many of us of the development of man, from baby to adult. Some therefore prefer a more neutral term. Maturity Models are used – especially in the ICT industry where they originated – for different purposes. You can for instance use them to evaluate performances and to assess by conducting a gap analysis. You can create insight as to the expertise and skills required for successful development. You can plot a road map to manage the expectations of managers or peers.

Preceeding the development of the Maturity Models to support the transformational change of our university was a comprehensive process. The University of Twente was seeking an instrument that could be used to create an image of the activities needed in the three to ten years ahead to establish the change to TEM. So, that's a road map – one of the activities for which Maturity Models can be used. In addition, both the department of Strategy & Policy *and* the University Council requested an instrument to assess the quality of the new modules. In other words: performances needed to be assessed – again, something to which Maturity Models could provide a meaningful contribution.

After this we executed a plan with two parallel work streams: we did a literature review about change management and we started a search for Maturity Models that focus on educational aspects. Initially, we focused the literature review on 'planned change' approaches, mainly because of their popularity. Since we found limited evidence for the effectiveness of planned change (Todnem By, 2005), especially in a university setting with its complex culture (Julius et al., 1999; Graham, 2012; Rahschulte, 2007), we redirected our search to other change approaches. Two sources proved very valuable. One was Van de Ven and Poole (1995), the other Kezar (2001).

The second work stream – the literature search for Maturity Models – also proved useful. We found that the use of growth models is rather popular in industries outside higher education. Maturity Models are used mostly in the ICT industry. The *Capability Maturity Model* from 1993 (Röglinger, Pöppelbuß, & Becker, 2012) demonstrates this. We found no literature on the use of this kind of models in higher education, nor Maturity Models that – conceptually or practically – could fit the needs of the University of Twente. On the other hand, we did find work of Weimer (2002) and literature concerning so-called *stage models* in higher education (e.g. Biggs, 1999; Dreyfus, Dreyfus, & Athanasiou, 1986; Grow, 1991; Kugel, 1993; Post, 2011; Stigmar, 2010). After analysis of a number of these models the simple concepts of Grow and Biggs best suited our aim. We didn't find a model that combined both the student and teacher dimension. Therefore, we concluded that combining the work of Grow (student), Weimer (student-centred education) and Biggs (teacher development) would be a good way to go. We combined the works of these three authors into a single model, which resulted in Maturity Model 2 (see figure 2).

Applicability

When we brought both work streams together and held our Maturity Models against the light of Kezar's (2001) seventeen change principles to apply a limited theoretical validation, our Maturity Models appeared to support a broad set of change principles. This suggests that these instruments have good applicability to support transformational change. Table 1 lists some examples of change principles that show applicability of Maturity Models as instruments for transformational change.

Successively, we have developed several Maturity Models. Each model can be deployed in a different context and serves a different goal. Predecessors of the first Maturity Model were used in the evaluation of modules of two pilot degree programmes in 2012-2013. Teachers who were a member of module teams scored their modules on the Maturity Model to support discussions during these evaluation sessions.

The first model (see figure 1) is based on the findings of these pilot evaluations.

Van de Ven and Poole (1995) have analysed 200,000 sources, and constructed four groups of general change theories. Kezar (2001), building on Van de Ven & Poole, constructed six change theories specifically for university settings. Kezar added no

Table 1: *Examples of the applicability of Maturity Models regarding Kezar's change principles*

Principle	Fit with our Maturity Models
Realize that change in higher education is often political (principle 3)	Maturity Models aid the discussion about the change process, political issues might come to light. We are aware of the danger of misuse of the Maturity Models. These models might, for example, be used as controlling instruments.
Construct opportunities for interaction to develop new mental models (principle 6)	It is important to bring people together to help employees understand the change. New mental models should be developed and integrated with their existing understanding. Maturity Models provide people insight in the change process and why they are currently facing certain problems. New mental models might be created.
Facilitate shared governance and collective decision-making (principle 10)	A shared governance process with joint activities of administrators and faculty can create change. As our Maturity Models aid the discussion, they might bring administrators and faculty closer together.
Be aware that various levels or aspects of the organization will need different change models (principle 15)	Different points in time, different departments or different subjects of change might ask for different models. Therefore we made different Maturity Models – each having their own goal.
Consider combining models or approaches, as is demonstrated within the multiple models (principle 17)	Using the principles as guides, each institution can develop its own combined model based on the type and scale of change, institutional structure, environment, and culture. Our Maturity Models fit with our academic culture and the change process we are in.

less than 17 research-based change principles based on six change theories.

These evaluations gave us a thorough view and comprehension of our situation. Also, the Executive Board has used this Maturity Model to discuss, communicated and shape the evolutionary development of TEM. A road map for TEM was developed based on this model. The model predicts an S-shaped growth curve:

a significant growth is possible by a change from teacher-centred to student-centred education (Weimer, 2002). This is depicted in the lowest row, where it says 'teacher'. With one of the educational directors we discussed potential interventions to trigger the growth acceleration. What can one do to make sure that the penny drops? Which interventions are needed? The gap analysis was made, but it did not provide the insight into what was required to make a big leap forward.

To target this situation the second Maturity Model (see figure 2) was developed.

> ## The goal of the evaluations was to prevent that all would fall into the same pitfalls

This model focuses on the development of teachers (from teacher-centredness to student-centredness) and maps what is needed to do this successfully – one of the aims of Maturity Models we described earlier in this paper. For example, this model shows that when a teacher views her/himself as an authority, responsible for transferring content, s(h)e will create a situation of dependence of the students. The model has been used in various groups and in one-on-one situations. It appeared to be helpful for teachers to broaden their horizon and for educational directors to get TEM's long-term goals in sight. It supported the development of the insight that a specific way of thinking is required and that teacher development is needed.

The third model was developed for the evaluation of the first modules of all bachelor's degree programmes in the full scale implementation of TEM.

Teacher teams scored their modules on the Maturity Model, much like they did in the pilot. By aggregating different scores we were able to map in which phase the University of Twente was in the implementation of TEM – as seen at the level of modules. So, performances were evaluated – again an aim that Maturity Models can serve. For us, the goal of these growth models was not the use as a yardstick but to provide a language for this complex change.

SITUATIONAL		0. Fully traditional (Pre-TEM)	1. First design of TEM module	2. First evolutionary improvement	3. 'Thinking around' to TEM	4. Full TEM	('From Good to Great')
MODULE DESIGN	*Character-istics*	N/A	• Learning pathways leading • One of the module parts carries the Theme	• (Almost) all parts are attuned to the Theme	• Authentic (= 'real life'), significant project for application or theory development • Students responsible for independent learning	• Authentic (= 'real life'), significant project for application or theory development • Students responsible for independent learning • Solutions for weaknesses of step 3	
	Study load	Good	Overloaded	Load larger than nominal number of credits (ECs)	Load conforms to nominal number of credits (ECs)	Load conforms to nominal number of credits (ECs)	
	Integration	N/A	Parts not integrated	Limited parts integration	Integrated on Theme	Integrated on Theme	
ASSESS-MENT	*Character-istics*	• Pass rate per 5 EC course around 70% • Some possibilities for compensation and resits	• Many assessments of parts (in learning pathways or parts) and project is assessed separately • Main focus on learning pathways instead of on module or project • Some experiments with different types of assessment • Struggle with study yield / resits / compensation	• Amount of assessment of parts somewhat reduced, project assessed separately • A bit more group assessment • Main focus shifts to module / project • Assessment experiments embedded better, via student training • Staff meetings for Pass / Fail	• Amount of assessment of parts reduced, partly because of compensation • Solutions for free-riding • Transfer of responsibility for peer assessment to students	• 'Doing = passing' • Students and teachers appreciate the assessments within TEM • Student learning goals are met. Degree programme is accreditable.	
	Mix	• Individual written assessments, per course	• Many individual assessments	• Many written assessments (especially in larger groups)	• Group and individual project assessment has a central place in the module • Mix of assessment types, depending on situation	• Group and individual project assessment has a central place in the module • Mix of assessment types, depending on situation	
PROJECT	*Importance*	N/A	• 'First, we need classic knowledge transfer (lecture)'	• 'Project is useful, but an extra'. Other parts are the largest source of knowledge	• Project is essential • Project is central, proactive learning by students • Everything comes together in the project	• Project is essential, is central, proactive learning by students • Students learn a lot from research and choice of problem	
	Type	N/A	• Small project, often at the end of the module	• Small project, at the end and right at the start (appetizer)	• Large project	• Large project	
TEACHER		• Teacher-centered • Teacher as source of knowledge • Teacher 'holds students close-by'	• Teacher-centered • Teacher as source of knowledge • Teacher 'holds students close-by'	• Teacher-centered • Teacher as source of knowledge • Teacher 'holds students close-by'	• Teacher focuses on student responsibility for their learning • Tutor as coach • Teacher team • Teacher 'lets go' and 'gives trust'	• Teacher focuses on student responsibility for their learning • Tutor as coach • Teacher team • Teacher 'lets go' and 'gives trust'	

Figure 1: *First Maturity Model for TEM modules*

By being able to clarify why teachers ran into specific problems, we wanted to support module teams to make a step towards well-designed TEM modules. The goal of the evaluations was to enhance the peer learning and to prevent that all would fall into the same pitfalls. So, the Maturity Model served as a conversation piece that was always connected with a meeting. In this third model the TEM vision was summarised in the final phase, to trigger discussion with the module teams. This model represents the various aspects of a module and highlights the interdependencies (visualized by the crosses between the cells).

As an example: do you see the project as an extra and not as a central component of the module and do you wish to offer separate domain-specific courses, than this will give a mismatch with the one final grade system of the modules. In addition, problems will result if the assessment is still in phase 2 while the module design already has reached phase 4 (see figure 3).

We have presented both types of Maturity Models outside our university, at a meeting of Dutch university strategy directors and educationalists. Both groups showed significant interest.

SITUATIONAL	PHASES TOWARDS SELF-STEERED STUDENT LEARNING			
STUDENT → / TEACHER ↓	Phase 1 Dependent	Phase 2 Interested	Phase 3 Involved	Phase 4 Self-steering
Weimer — Teacher role	Authority expert	Motivator Guide	Facilitator	Advisor Delegator
Influence, steering	At teacher	At teacher	Teacher + students	Students + Teacher
The role of content	Goal	- - - - - - - - - - - - - - - →		Means, use
Responsible for learning	Teacher	- - - - - - - - - - - - - - - →		Students
Role of assessment	Grading	- - - - - - - - - - - - - - - →		To promote learning

Biggs	LEVEL	Level 1	Level 2	Level 3
	Focus	What the student is	What the teacher does	What the student does
	Responsibility of teacher	Knowing and transferring content	Also (complex) concepts and understanding	That learning takes place
	Goal of teacher	Transferring content	Transferring content	That students learn
	Attention for	…	Management + didactic technique (a lot)	The meaning of understanding
	Typification, Consequence	'Blame the student'	'Blame the lecturer'	Learning

Figure 2: *Maturity Model for teacher development towards student-centredness*
(An error in the Dutch original, where it here reads 'Advisor Delegator', was corrected)

Not a 'holy grail'

Still, the question remains if Maturity Models can obtain the results as mentioned in the literature and as we saw before us. Can one assess performances with MMs, clarify which expertise and skills are required for a successful development, develop a road map or manage expectations? The answer to this is: yes and no. For some of these goals Maturity Models were found to be very useful. But for other goals the Maturity Model (also) is not by definition the 'holy grail'. Not surprisingly, it depends fully on the way one deploys these models.

Unfortunately, our Maturity Models were unable to prevent that 'everyone fell into the same pitfall'. We have also noticed that our forecast regarding the first phases of Maturity Model 1 became a reality. Teacher teams were found to learn only limitedly from each other, so teaching and learning in the first TEM cohort were subject to typical startup problems that are connected to educational renewal. Having a Maturity Model could not prevent this.

	1 Initial phase	2 Experiment phase	3 (r)evolution phase	4 On to the TOM phase	5 Final vision
Character	The lecturers run their own individual programme; knowledge is offered in lots (according to the organization of the departments). The module provides no context. Only mathematics or research methods (M&T) education is shared.	The lecturers largely run their own individual programme; knowledge is offered in lots (according to the organization of the departments). Only the project has a realistic context. Only mathematics or M&T education is shared.	The module is designed on the basis of the module theme instead of the organization of the departments. A number of module components have a realistic context. Only mathematics or M&T education is shared.	The module is a unit. Multiple module components have a realistic context. A number of module components are, where possible, shared with other courses.	*The module is an entity and has a realistic context. Multiple module components or the entire module are, where possible, shared with other courses.*
Education culture	Learning is an individual process. Teaching is regarded as instructing. The transfer of knowledge and the determination of the educational content and pace is the responsibility of the lecturer.	Learning is mainly an individual process. Only the group process is the responsibility of the students. The lecturer determines the educational content and pace. The lecturer and/or tutor takes the initiative for and in meetings.	Learning is both an individual and a collective process, students also work together outside the project. The lecturer is not the only one responsible for the learning resources provided. Students take the lead during tutor meetings.	Learning is a collaborative process. Students often work together and are responsible for their work. The lecturer facilitates learning; students have input in tutor and educational meetings.	*Learning is a collaborative process. Students are held responsible for their own and each other's learning process and have input in the learning resources. Students have input in tutor and educational meetings.*
Organisation	Lectures and practicals predominate. The weeks are all divided in the same way and education is scheduled from hour to hour.	Lectures and practicals predominate. The arrangement of the weeks may vary. Education is scheduled from hour to hour.	The project and other teaching methods is divided about 50/50. The weekly schedule varies a little per week. Formal education and project meetings are scheduled.	Project work predominates. The weekly schedule varies per week. Only frontal teaching is scheduled, students schedule project hours themselves.	*The project work predominates. There are fixed contact hours, but students arrange the rest of the week themselves.*
Project and integration	There is a small project at the very beginning or at the very end of the module. The project is regarded as a warming-up or closing of the module.	There is a small project in the module. Other module components are separate from the project (there is no integration), only the theme is similar.	There is a fairly large project in the module, and this is integrated with a number of module components that are required to be able to perform the project (application).	There is a large project in the module. The remaining module components form the basis for the project. Knowledge is applied in the project, but new knowledge and skills are also acquired.	*The module is designed based on the project; the module is a entity. Knowledge and skills of the various module components are fully integrated with one another. The module can only be achieved if the student mastered all of the subject matter.*
Assessment	All module components are assessed separately (according to the organization of the departments). There are no compensation possibilities between assessments. There are many sub-sub-assessments for a grade.	Many module components are assessed separately (according to the organization of the departments). There are no compensation possibilities. There are many sub-sub-assessments for a grade.	Some module components are assessed integrally, thus facilitating compensation. Certain module components are diagnostically assessed. Different types of assessment are used.	Some module components are assessed integrally, thus facilitating compensation. Much of the assessment is diagnostic. The form of assessment is consistent with the learning objectives and teaching methods.	*Some module components are assessed integrally, thus facilitating compensation. The form of assessment is consistent with the relevant learning objective. There are plenty of feedback moments, for example by means of diagnostic assessments.*

Figure 3: *Redeveloped Maturity Model for TEM modules*

Maybe startup problems could have been prevented if the model was used in the module design stage. In that case the model could have provided insights in a smart TEM-like module design. However, we've used this model only after conclusion of the module delivery, during the evaluation – which for most module teams was too late to prevent them 'bumping their noses'. A number of teachers did use the model during the design of a subsequent module, because it showed them the way to go.

Using the Maturity Model as an evaluation instrument *after* delivering the module was not the best tactic for a second reason. Some teachers perceived the Maturity Models as a yardstick, despite our careful explanation that we wanted to use the model primarily as 'language'. The goal to assess performances (a desire from management) stood in the way of our actual goal (making insightful what is needed for successful development).

Possibly, we could have done a better job in explaining to both management and teachers what the usefulness and necessity was for the Maturity Models. Or we could have prevented wearing two different hats – of evaluator and advisor.

Yet, these Maturity Models are useful instruments with many possibilities. E.g., they enable a better view on the support that teacher teams need. Some module teams, for example, experienced that the electronic learning environment lacked certain functionalities to make the step towards the next phase. Also, it showed what didactical support is needed for module teams.

After having analysed the outcomes of the Maturity Model discussions, we discovered that 'assessment' was an aspect which, generally speaking, was in a less 'mature' phase than the other aspects in the model. This finding was in agreement with problems which educational programmes experienced with assessment in TEM: many educational programmes found it complex to change the testing regime, because of concerns that this would undermine the quality of the programme. So, as a diagnostic instrument the Maturity Model was excellent.

Moreover, Maturity Models help module teams to articulate why they made certain design choices. Especially, putting a compact and powerful statement in the model for the final goal proved enlightening for many. It allows module teams to reflect on the question whether this final goal can be realised in the team's discipline. Or on the question of wanting to realise student-centredness in the first year of the bachelor's programme, or in a later year. Also, our experiences show us that Maturity Models are useful for expectations management. For module teams it became clear what the organisation strives for – apart from the question whether the module team thinks the same. For management it has become clearer that a transformational change is not something that can be realised overnight.

A minimum of seven years

Even if the world around us would stand still, or if we wouldn't have to adapt to our surroundings, it would probably take at least seven years to fully introduce TEM.

> ## Some teachers saw Maturity Models as yardstick, despite our careful explanation that we didn't intend to

The implementation of TEM requires a culture change, a different way of thinking and acting. The changes that have been made to date are mostly organisational changes in the structure of the educational programmes (working and collaborating in modules). Despite the fact that these are big steps, the turn-around to student-driven education has not yet been fully made. The question arises whether deploying Maturity Models can expedite this change process. According to the S-shaped Maturity Model 1 change will be fast once the penny drops. The Maturity Model clarifies *that* something needs to change, and w*hat* that is. The how *will* continue to occupy us at the University of Twente for a number of years.

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