NETWORKING CHANGE LEADER – NEW ROLE FOR A PROGRAM DIRECTOR IN ENGINEERING EDUCATION

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ABSTRACT

Calls for changes in higher education are omnipresent and motivated by major challenges for society. Several of these challenges, for example those related to digitalization and sustainability, falls into the category of emerging and transformative challenges. The breadth and width of such challenges is too large to be handled by a single individual or even a small group of individuals. Instead, their solution requires an adaptive leadership with relevant activities at all organizational levels. From research literature and previous successful change processes, it is known that change leaders in the middle are key players during such transformations. In engineering education (and in fact in any other education aiming for a profession), it is natural that this role is taken by a program director who already has a responsibility for the quality and the development of an engineering program.

In this work, I will approach the role of a program director from a logical perspective using arguments based on a simple comparison between available time and total time required to create the desired change. It is obvious that large challenges demand a substantial amount of time to find an acceptable solution, which is outside of the reach for any single individual. I will also discuss the crucial role of persons in the middle for obtaining successful change related to large challenges. Based on my own case, I will try to give some advice about how a program director in the role as a person in the middle can handle this pressing situation. I will point towards the needs of personal time management, a basic understanding of agile change management, the ability to create structures and collaborative efforts that promote agile actions, the need for making coherence and using inclusion strategies and the necessity of networking. I will also emphasize the importance that universities support internal and external networking structures.

KEYWORDS

Engineering education, change management, role of program director, Standards: 3, 9, 12.

INTRODUCTION

Presently, there are strong societal demands for changes in higher education as manifested in debate articles (Mintz, 2019; Kurshan, 2020) and guest editorials (Martin et al, 2022). However, it has also been recognized that change must occur in a thriving atmosphere (Lake & Buelow, 2021) to conserve the well-being of those involved in the change process. On a general level, there is a strong demand from society that higher education should educate a new generation of individuals who can solve today's global challenges (Schmelkes, 2022, Martin et al, 2022). This also affects engineering education at the same time as there are many other challenges to address for example related to the ongoing digitalization (Brooks & McCormack, 2021), globalization (Varghese, 2013) and the need for introducing better ways of student-centered learning (Kober, 2015; Waldrop, 2015). All these factors contribute to demands for substantial change of both goals, content, and format of delivery in engineering education, which put severe pressure on all levels in the organization, something that became apparent when analyzing the emergent teaching during the pandemic (Graham, 2022). Hence, it is urgent to find ways to handle and manage this complex situation in an efficient way and to put this development into some simple and understandable context.

From management literature, it has for a long time been known that large scale changes are hard to manage (Kotter, 1995). This has also been experienced in higher education, where resistance towards change occurs from many factors as for example senses of territory, issues related to time and resources, long-lived traditions, individual fear for threats against autonomy and shortcomings in leadership or communication (Chandler, 2010). On the other side, there has been several attempts to identify success factors for obtaining sustainable systemic change in higher education and some of those factors are:

• Initiation created by a response to a common set of circumstance (Graham, 2012) or through an internal crisis becoming obvious to everyone from external input (Cohen et al, 2003).
• Coherent and interconnected curricular structure (Graham, 2012; Crawley et al, 2007).
• Leadership support from department heads (Graham, 2012; Cohen et al, 2003).
• An ongoing focus on educational innovation and reinvention (Graham, 2012).
• A flexible organizational culture (Kleijnen et al, 2014)
• Connection to teacher's day-to-day work (Kleijnen et al, 2014)

Another approach is to consult the extensive research literature on change management. Due to some issues related to the use of change theory in STEM higher education (Reinholz, White & Andrews, 2021), I will for the moment postpone this discussion and instead base my argumentation on some logical facts related to limitations in the use of time:

• Time goes equally fast for everyone, which put limits on the time a single individual can spend on solving a challenge.
• Small challenges are then within the reach of single individuals or a small group of individuals.
• Large challenges are time-consuming and, hence, they require the involvement of many cooperating individuals.
• Large challenges often involve more advanced human skills like learning, design and innovation, which further increases the required time.
• Clever division of workload between individuals reduces the time for finding a solution.

On top of this, limitations in available resources require that challenges are solved in an efficient way. For human-intense activities like education and educational development this

usually comes back to limitations in available time, which was found as one of the factors creating resistance against educational development (Chandler, 2010). When the total required time is within the reach of a single individual or a small cooperating group of individuals, we essentially already have the tools and methods to solve such challenges. Teaching students these skills have traditionally been a strong part of an engineering education and is an integrated part of traditional engineering values. This is also reflected in how universities are built up around independent small and middle-sized research groups.

Nowadays, society also expects higher education to educate students who can tackle large challenges related to for example sustainability and digitalization. The solutions to such challenges require the cooperative effort of many individuals, which means that the total time spent on finding a solution is larger than what can be accomplished by a few individuals in a reasonable amount of time. Hence, the solution to such problem also includes the skills to cooperate. Since universities are traditionally not organized to solve such challenges, it explains the resistance related to traditions and sense of territory identified by Chandler (2010). Furthermore, if excessive time is spent due to bad management of the cooperative effort, resistance is created due to leadership and communication issues (Chandler, 2010).

The complexity of the problem also makes it impossible for managers at the top level of the organization to steer the development in detail, since they do not have a sufficient overview of all details and it is also impossible for them to a priori forecast the usefulness of innovative ideas created locally within the organization. Hence, one-directional top-down management approaches are undesirable in these situations (Heifetz, Grashow & Linsky, 2009). On the other hand, locally found innovative ideas may conflict with overarching goals and may need to be adapted (or in some cases even rejected) when transferred into new circumstances.

In this work, I will restrict myself to discuss large challenges and what consequences they have for a program director (or for a person in an equivalent position) of an engineering educational program. Since it is usually part of the responsibilities of a program director to lead future development in an educational program, it is clear from the arguments above that a program director must mediate between several perspectives where some may be contradictious and others may require larger change efforts than can be handles within a small group of people. The solution to such challenges requires the use of adequate change management skills and strategies at all levels. Finally, I will try to give some answers to the question how a program director can handle such a pressing situation.

CHANGE MANAGEMENT

This work is about how to handle large complex challenges, which are complex in the sense that reaching a sufficiently good solution is time-consuming, involve many people and require that those people learn new things during the change process. In engineering education, two examples of such challenges are how to device efficient learning activities for sustainability and how to use digital tool in the best way to enhance learning. For *a single individual human being*, these challenges are overwhelming to handle (due to time constraints), but the challenges should be manageable for a larger group of people who collaborate in a time-efficient way. The question is then how to set up and sustain such a large-scale cooperative effort?

Since there are inherent limitations in how many social relations an individual can sustain (since building social relations takes time and time is a limited resource!), complex problem

solving is often handled through hierarchical structures. That implies that each level in the hierarchy only involves a manageable number of social relations. This type of collaborative effort between many individuals should work if the problem-solving methodology is a priori known. However, for challenging problems this is not the case, which implies that some type of organizational learning strategy is also needed to attain sustainable change (Boyce, 2003). In the Organizational Learning Framework (Crossan, Lane & White, 1999), innovation is considered as a key mechanism for development. This framework suggests an intertwined process between three levels in the organization (the individual level, the group level, and the organizational level) where individual ideas are grouped and forwarded upwards in the organization (bottom-up) at the same time as the organization monitors and handles the change process (top-down). When applied to higher education, Rikkerink et al (2016) has pointed out the need for proper leadership practices in the nexuses between the three levels in the Organizational Learning Framework.

The Organizational Learning Framework is centered around a hierarchical approach to achieve efficient information flow in two directions (bottom-up and top-down) with the overall goal of creating organizational learning. However, this framework does not consider the potential benefit of cross-links in the information flow created by networks. The positive links between networking, innovation and competitiveness are well established in industrial management (Pittaway et al, 2004). In a similar manner, the interwovenness of structural-agentic processes and the usefulness of academic freedom as room for maneuvering in curricular change in higher education has been pointed out by Annala et al (2021). This indicates that social interactions between people in the middle is an important factor for organizational learning in higher education.

This is in fact not at all surprising when considering that time is a limiting factor for all human beings. Hence, top managers do not have the time to overview all the details and individuals do not have the time to be active in the development of all new things. This directly puts the focus on the crucial role of people having positions in the middle and how they should act to support and enhance organizational learning. Logically speaking, their role is then to create coherence between top-down and bottom-up views within the organization and to ensure the efficient use of time (or equivalently human and economic resources). From studies of successful change processes in K-12 education, coherence has been seen as a key factor for success and is defined as a 'shared depth of understanding about the purpose and nature of the work' (Fullan & Quinn, 2016; Fullan, 2020). The role of the 'leaders in the middle' is then to establish 'a philosophy, structure and culture that promotes collaboration, initiative and responsiveness' (Hargreaves & Shirley, 2020). Similar ideas have also been put forward for change in higher education, where the importance of balance, sense-making, and interconnected strategies have been noticed (Kezar & Eckel, 2002).

However, the situation for higher educational institutions is even more complex. In a UK context (and probably in the context of many other countries as well), a majority of engineering academics and researchers find that teaching is afforded little or no value in academic promotion procedures (Graham, 2015). With a perceived low value, it is no surprise that change in higher education to a large extent will be driven by rather lonely and devoted educators. Due to their own time constraints, those educators can only approach challenges that are solvable on the individual or small group levels. This points towards a systemic weakness in the ability to handle large challenges, which are characterized by the cooperation of a larger number of people than is available on the local level. Hence, it is no surprise that change in higher education is perceived to be slow and difficult to manage. In fact, large systemic change seems to either occur under a considerable external or internal pressure that

creates common sets of circumstances (Cohen et al 2003; Graham, 2012) or through a deliberate combination of vision creation, coalition formation, communication, faculty empowerment and culture consolidation (Jiang, 2022). Both these approaches have in common that they use motivating factors (threats or visions) to mobilize a sufficiently large workforce to meet the challenges within a reasonable time by sharing the workload.

In a recent review article, Reinholz, White & Andrews (2022) draws the conclusion that earlier attempts to use change theory in STEM higher education have mainly been based on theories for individual change instead of theories that also considers the system in which the change takes place. They identified a lack of theoretical coherence, a greater need to focus on diversity, equity and inclusion and the need for formal opportunities for scholars to learn about change and change theory (Reinholz, White & Andrews, 2022). There is also some evidence that more generic change models stemming from industrial management need to be somewhat modified when applied to higher education due to institutional and cultural differences (Jiang, 2022).

Since higher education involves many disciplines with varying scientific traditions, there are also a larger need for local adaptation during change as compared to other areas of society. Hence, time-limiting arguments for top managers in higher education makes it even more impossible for them to control all the details during a large change process. Once again, the leaders in the middle become essential for the development suggesting a distributed leadership model (Jones & Harvey, 2017). However, time is also a limiting factor for people in the middle which implies that they need some sort of support to be able to fulfill their duties to create coherence between local traditions and overarching goals during a change process. These insights are also reflected in recent research about change processes in higher education, which discuss questions about how to enable educational innovation and change through complexity leadership (Schophuizen et al, 2022) and how to use various strategies of promoting networking to boost the development (Stasewitsch, Dokuka & Kauffeld, 2022; Högfeldt et al, 2022).

THE ROLE OF THE PROGRAM DIRECTOR

For an engineering education program, the role of the leader in the middle is in most cases taken by a program director. The simple reason is that top leaders do not have sufficient time and putting all the responsibility on all teachers will give them too much workload, which causes risks for their health. Hence, neither a top-down solutions nor a solution where all pressure is put on individual teachers will work in practice. The duties then fall on the program director considering the evidence from change literature that leaders in the middle are crucial for obtaining sustainable change. However, time limitations also apply to a program director who is in an even more difficult position having to moderate and create coherence between overarching goals, local traditions, innovations, and local suggestions for change in an engineering program. Hence, a central question in this work is how a program director can handle such a pressing situation?

The research literature on the role and actions of a program director is very limited and usually deals with other aspects like for example the balance between formal and informal power (Högfeldt et al, 2017) or looks at the development through the lenses of executive coaches (Vlachopoulos, 2021). Here, I will instead use my own case based on six year's experiences as a program director of a master program – a duty that is expected to take 22% of my time. When taking over these duties in 2017, the local faculty was hesitant to to any change due to a successful evaluation of the program in a national review (UKÄ, 2013). Today, they have

become more agile and participate in the development of the program at the same time as the number of students has increased by 25%, indicating a successful change process.

The main challenge as a leader in the middle has been my own time limitations, which imply that I can neither be involved in following all development trends nor be able to do all the necessary work at the local level. A primary priority has been to ensure that the time reserved for my duties included a reasonable amount of time for reflecting about and leading program development. A constructive dialogue between the program director and leaders within the organization may help to give the program director the necessary time and mandate to lead educational change. However, a faster approach is to reconsider how to save time spent on routine tasks and documentation (without reducing quality). Another issue is to streamline the information flow within the program to reduce unnecessary questions. Also, a program director should use a minimum of time to obtain all relevant information about the program that is required to take informed decisions about complex challenges. In the long run, relevant information can be made available from the university, but the university does not a priori know what information the program director need. If relevant information or efficient processes are missing, they may need to be developed. An example of this is the procedure to include student views in an efficient way for program development (Leander Zaar and Andersson, 2020), which was developed by a student with me as project leader. For larger projects, a constructive dialogue among program directors and managers is necessary to ensure an efficient use of resources and to create coherence in the organization.

When time is redistributed towards leading educational development, a program directors' role is to take a broad view of the program including several perspectives and to use relevant information to identify potential points of improvements that are *essential for improving the program*. Engineering education programs aspires to educate engineers for different roles in society, which require different knowledges and skills. However, suggestions for change from top managers or from single individuals are perhaps not beneficial for the specific program. This is not surprising, since time limitations promotes suboptimizations of a problem. To be time efficient, a program director needs to filter the information flow and prioritize those issues that are most beneficial for program development. Furthermore, a program director also needs to be pro-active and gather relevant information about novel educational issues to make informed strategic decisions. Being curious and networking with other people is a rather efficient way to get informed.

When it comes to the implementation phase, a program director is responsible for getting the work done but does not have the time to do all the required work. Since other people should do the main work, it is a crucial issue to consider how to organize the change process (who should be involved and how to distribute the workload) to be efficient. For implementations that require a small number of people, it is sufficient to give them the mandate and the main directions to come up with a solution. An example from my own practice is that I give the mandate to a relevant group of teachers to suggest a revision of the course structure for a track within the program. I designate a coordinator for the task and help the coordinator to get funded. I set up relevant program level limitations for the work and demand that their suggested solution should fulfil these limitations and solve known issues. Furthermore, I demand that the working principle for the group must be inclusive and involve opinions from all teachers within the track and from students. The inclusive strategy assists in building trust, keeps up motivation and helps to set up a good climate for change. During the work, I check that the work is progressing and do not interfere with program goals, giving the group a large freedom to come up with innovative ideas. Three out of five tracks have so far been changed in this way.

This works for small and medium challenges. However, when it comes to large challenges, a program director needs to be personally involved in the work. The simple reason is that large challenges also require that a program director must learn new things. In fact, this is a characteristic feature of this type of challenges (Heifetz, Grashow & Linsky, 2009). Since personal involvement is essential (no one else knows the program aspects as well as the program director), the program director needs to gather information and is responsible for strategic decisions. To use time in an efficient way, only ideas that are relevant for the development of the specific program are condensed and forwarded to a group of teachers and students working on the problem. Based on the results of such discussions, it is possible to continue by starting small development projects. Obviously, a program director has time limitations and should not be left alone during the overarching work. Hence, it is important to spend some time on networking, where large challenges can be discussed and where one can learn from each other's experiences. In the ideal case, these networks are set up and offered by the university (Stasewitsch, Dokuka & Kauffeld, 2022; Högfeldt et al, 2022), but taking part in external networking which for example occurs during the CDIO Conferences is also a pathway for getting ideas for further development.

CONCLUSIONS

I have shown that inherent time limitations when solving large challenges puts the role of a program directors into a new context. Since such challenges involve organizational learning, the role of a program director as an agile change leader becomes apparent. This implies that in the future, program directors need to have some basic understanding of the principles behind agile change management. Hence, they need to reduce the time spent on routine tasks to instead use their time to actively reflect on the role of the program for society, participate in networking activities and consider their role as 'leaders in the middle' when communicating with both managers, teachers, and students in the program. According to my own experiences, reflecting and analyzing time efficiency when working with change, has been useful both for me and for the teachers within the program in our work to improve the program.

LIMITATIONS AND FUTURE WORK

In this work, I have assumed that a program director is the natural person to lead change from the middle. However, other ways to manage complex change processes are also expected to work provided that the functionality to mediate between overarching goals and local cultures is preserved. Such a functionality can either be taken by a networking individual (working together with several program directors) or by a group of networking individuals. A few examples for such strategies are to form coalitions that jointly investigate new opportunities through pilot studies or to form coalitions related to common needs for change.

To keep up pace in a complex change process, several change initiatives need to run in parallel. This clearly goes beyond the time limitations of a single program director. Hence, a university needs to implement a coherent overarching structure to efficiently support 'leaders in the middle' with relevant data and with opportunities to network, learn from each other, and to join forces to solve large scale challenges (which are outside the scope of a program director). Furthermore, there is a need from university leaders to clearly communicate the needs for change and their reason for choice of change model to faculty. The framework for 'Future Education' (KTH, 2023) is one example from our university about how to approach these issues.

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