

Achieving Sustainable Building Education the Case of Polytechnics in Ghana

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Abstract

The construction industry in Ghana is suffering a number of problems at all levels with regards to materials, machinery, personal organization and information.

This has its consequences for the production of buildings and amongst them housing. One of the solutions is thought in improving the technical education of the new staff for the construction industry. This paper reports of a successful (NPT) Nuffic project whereby the TU/e worked closely together with the two Ghanaian partners the Polytechnics in Sunyani and Cape Coast and the Kwame Nkrumah University of Science and Technology (KNUST) in Kumasi. The approach of improving education was at different levels:

- a) The development of a new curriculum.
- b) Upgrading of laboratories and workshops at both polytechnics.
- c) The staff could follow upgrading courses to get a graduation of Bsc or Msc level.
- d) Some ((Msc) level) staff members were allowed to leave the country for a phd study in one of the specific teaching areas at the TU/e.

The main point was to involve the construction industry in both the curriculum development and in the practice of teaching and apprenticeships. In December 2006 was a mid-term review as the project is half way. A number of promising results can be reported. Although some financial input is required in our view this way of approaching a problematic construction industry will bear its fruits in the nearby future. Already in September 2007 the new curriculum will be launched so that the industry will be reinforced with staff of a higher quality. The sustainability is guaranteed as the upgrading project was fully embedded Ghanaian context with full support of all parties involved.

1 Introduction

When traveling through Africa one encounters in cities high tech buildings and facilities next to impoverished improvised shacks. This contrast is typically for developing countries, with its extremes between rich and poor. Many reasons can be found to explain this phenomenon. Such as the unequal spread of financial means and the inability to redistribute them.

The countries' capability of acquiring proper financing and investments is low and when funding becomes available the quality and composition of the building and construction industry does not contribute to a good and efficient use of the money.

Apart from more general causes, during the construction on site shows the quality and bad performance of this industry: caused by the low level of trained personnel, lack of qualified supervision, unused equipment etc., at building sites.

For the Ghanaian situation this was one of the reasons to set-up an improved education program for the existing polytechnics being undertaken by the TU/e and two Ghanaian polytechnics of Sunyani and Cape Coast in close cooperation with KNUST in Kumasi. This paper will describe the methodology and the results so far of this project.

2 The applied methodology

In order to establish the 'ideal' characteristics and qualities of staff graduating from the PT's, a needs assessment study of the building and construction industry was undertaken.

The NA took place in 2005 by the authors of this paper. A multi-disciplinary approach in which socio-economics, engineering and educational studies were combined, was used. This was done in various ways through a literature survey and in depth interviews. Consultants, contractors, the teachers of polytechnics, and government authorities were interviewed, which led to a clear view of the 'state' of the art and ideas for the future.

Based on this NA the 'ideal' PT graduate could be 'profiled' which formed the basis for the formulation of this terms of reference for an improved building education.

The next project phase was to structure the upgrading process for the Polytechnics by the following activities:

- A. development of a new curriculum
- B. upgrading of laboratories and workshops
- C. upgrading of staff to Bsc or Msc level
- D. upgrading of directors to PhD level

All these activities will be further detailed in the next paragraphs.

3 Needs assessment study

Problems in the Ghanaian Building & Construction Industry

The construction industry in Ghana is characterised by a multiplicity of small firms. Even though these firms play a significant role in the construction industry their performance does not meet the required standards. A major bottleneck that needs to be solved is the lack of skilled and experienced labourforce. In interviews and discussions with professionals in the construction Industry and consultancy companies during the needs assessment mission in Ghana in 2005 a number of problems were put forward particularly regarding their labourforce. They mentioned that workers in the construction industry lack of taking initiative have limited skills in problem solving, lack quality conscience and are not critical.

The problems that were encountered in the construction industry in Ghana can be grouped under different categories. (see Table 1). Some of the problems can be grouped at national level other problems have to do with the building industry in general and some originate from personal behaviour or the professional attitude of the worker. The employers of construction workers expressed their wish to include more practical exercises and practical experience in education programs.

Problems at the polytechnics.

The polytechnics provide training at post-secondary level leading towards a Higher National Diploma (HND) in Building Technology. They are expected to fill the void by training mid-level personnel capable of supervising the artisans so as to produce high quality buildings. Seven of the 10 polytechnics in Ghana provide training in Building technology at HND level. These polytechnics however are confronted by the perennial problem of inadequate funding and poor working conditions in the tertiary education sector in Ghana. The seven polytechnics that offer Building Technology together produce about 350 graduates per year instead of the industry requirement of about 700. Furthermore, a majority of these graduates cannot join the building construction industry because they lack practical skills and competencies. The absence of practical training has led to a dearth of site technicians, quantity surveyors, qualified foremen, and middle level management for supervisory roles in the industry. Many graduates therefore end up taking up teaching positions in the secondary, technical and vocational schools. The government has the objective of improving polytechnic education by providing infrastructure for teaching and learning but this objective has not crystallised into concrete action that is manifest in improvement in infrastructure, staff quality and equipment. There is thus a gap between what is desired and what is available. This gap can be filled by the programme via revision of the curricula, staff training and the establishment of laboratories and workshops.

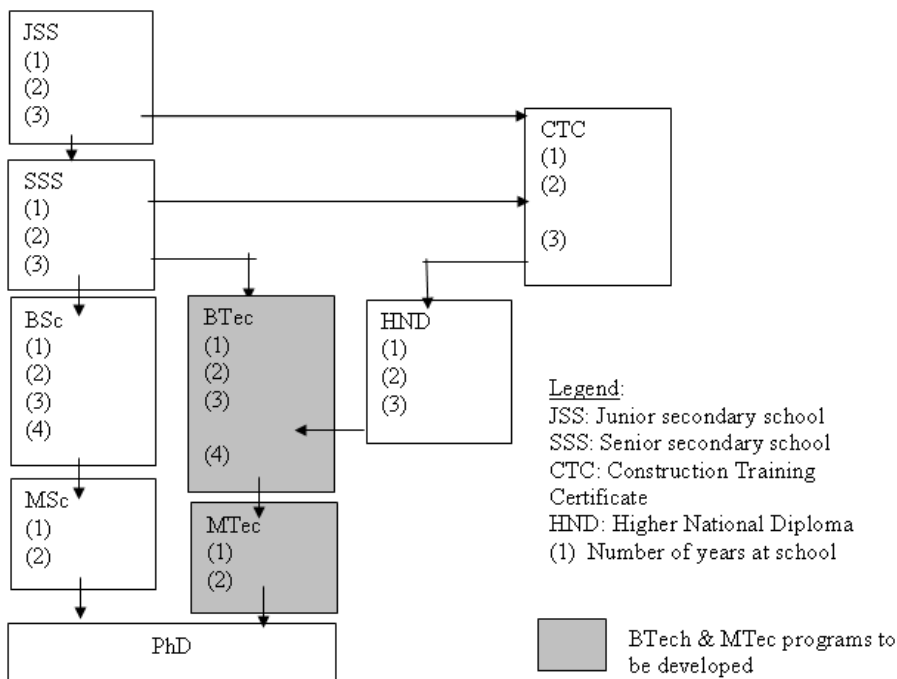
Conclusions from the needs assessment study

The interviews confirmed that proper education is a basic requirement and is lacking. From a national perspective the CI problems can better be addressed when the education level of the HND (Higher National Degree) should be improved as students with a HND degree are not eligible to study for a Bsc degree at a university the set-up of a Btech education in order to supply middle and higher staff is highly recommend.

Table 1: Problems in the Ghanaian Building & Construction Industry: An excerpt Source: Egmond, E van & Erkelens PA (Febr2005)

| |
|---|
| Building industry |
| - Much supervision is needed. - Lack of standardization. - Employees can only be used for non critical activities. - Gap between HND and the theoretic Msc |
| Job competencies |
| - The artisan misses pride. - Low level artisan learned the job from his father. - Lack of interest in quality. - Low level of quality awareness. - Only the how is important not the why. |
| Personal |
| - One 'lives per day'. - Family affairs has priority. - Lack of discipline. - Employers are seen as fathers → which means a father-son relation. - Lack of sense for time. - Loyalty sometimes higher than of foreign workers. |
| National |
| - Examination results are being falsified. - Bureaucracy |

Figure 1: GHANAIAN TECHNICAL EDUCATION STRUCTURE



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In conclusion revision of the curricula for the Building Technology education programs at Cape Coast and Sunyani Polytechnics is relevant and shall be in accordance to international standards.

3.1 Development of a new curriculum

As has been indicated in the method curriculum development is the backbone of the new education.

The requirement for the new curriculum is that it shall be competence based. Competence based training (CBT) is a 'new learning' concept. It is being promoted in education throughout the world. The basic assumption is that students are more likely to learn what their future employers expect from them.

However the findings of the Needs Assessment indicate a relatively large gap between the present culture of teaching and learning as well as the capacities and facilities at the Polytechs and those required for application of the CBT methodology advocated by JICA. (Egmond, E van & Erkelens, PA, 2005) Moreover discussions with experts on this field in the Netherlands indicated that also here educational institutes are still wrestling with the method.

Of course the required competencies of the graduates in professional jobs in the construction industry will be taken into account as a focal issue during the development of the BTec curriculum by applying this adapted approach. The final approach to CBT will be more loosely as it requires both staff and student an attitude and discipline which is unknown so far. Apart from the required extra provisions for rooms, staff, databases, industrial contracts, etc.

The curriculum development has been done by the teachers themselves. Which is a new experience for them, to be able to shape the schools' future under guidance of the project team. The outline below shows the procedure which the team used in their work to elaborate the draft of the BTec curriculum:

1. To start with, the overall aim of the curriculum/education was stated and specific objectives defined
2. Possible areas of employment for graduates from the programme were identified and possible jobs/professions outlined.
3. To identify the specific competencies that must be developed in these graduates, a detailed job descriptions and job tasks of each of the possible jobs was prepared.
4. Jobs/professions that were more related in job tasks were grouped together and the overlapping tasks identified. Those that were unique were however allowed to stand.
5. The summary of these job tasks groupings were further synthesized and a final list of the professional tasks of a graduate of the programme prepared.
6. Using a comprehensive list of engineering employability skills of graduate engineers, the summary of job tasks were linked to the relevant employability skills.
7. To develop these competencies/skills to perform the specific job tasks, the appropriate teaching methods were identified.
8. On the basis of the overall goal of developing competencies, a general overview of the structure of the curriculum was developed. This involved defining the focus of the curriculum at each level/year and the specific competencies that must be developed.
9. Specific courses that relate to these levels and competencies were identified and so linked. This resulted in course groupings for the semesters' work
10. Details of the content of each of the courses were then developed together with the teaching and assessment methods.

3.2 Upgrading of laboratories and workshops

Another very important issue was the upgrading of teaching and learning facilities (study books and lecture notes, laboratories, workshops, furniture, equipment, tools) and ICT facilities (computer hardware and software).

Both PT's have already some facilities for teaching e.g. class rooms, workshops, laboratories, computer room and a library. However for the future it is foreseen that for each PT a more spacious workshop, a larger laboratory

and a larger computer room is needed in order to house equipment, computers and students. These facilities were ready by the end of 2005. Around 70 computers were made available by TU/e to the PT's. A first rough outline of the required facilities indicated that basic equipment in the field of testing and analysing properties and strength of building materials was indispensable. Also the access for both staff and students to ICT facilities like the Internet is a necessity. For the Departments of Building Technology at both the polytechnics it is needed that the already existing internet connections had to be extended.

The total amount available for investments fixed at EUR 225,000, to be equally divided amongst the two polytechnics.

All in all, a well balanced assessment, within the limitations of the available budget, could be elaborated and composed.

The required laboratory equipment has been purchased in the past year and shipped to Ghana. Although the labs are now more or less ready to receive and install the equipment. staff has not taken initiative to do this as they are not familiar with the new equipment and procedures. So this requires further coaching by the project team as well.

Teaching materials

With regard to the improvement of educational material for the envisaged curricula reference was made to extensive up-to-date lists of study books readily available for the traditional courses in BT like the City & Guilds' package for BT education in the UK. Many PTs, in particular in former UK colonies are certified and take their exams in accordance with the City & Guilds guidelines. However the PT staff has to develop additionally new teaching material. Some of those materials can be drawn from the thesis resulting of the individual Bsc/Msc studies at KNUST. The reference library needed to be improved, which can be achieved by acquisition of more books in the field of the new curricula topics. A basic library is more than relevant. Internet will play an important role for information in the future education. Those materials can be developed by PT staff over the years.

3.3 Upgrading of staff to Bsc-Msc level

All available teachers at Cape Coast and at Sunyani Polytechnic were interviewed. They were asked, apart from personal information about their background etc., to indicate on the proposed Btech list which topics they are teaching now at HND level and which Btech topics they like to teach in future. Also for the proposed Mtech list, the in the future qualified teachers were asked to indicate their interest for these Mtech topics.

For filling out the tables a distinction was made between those teachers qualified in the future for just HND teaching, Btech teaching and those qualified for Mtech teaching.

It was concluded that the staff of the departments in Building Technology at both institutions need improvement in their ability to handle theoretical and practical issues related to building technology and construction in general. It is therefore necessary that they become acquainted with recent trends in the sector. The Eindhoven University of Technology (TU/e) was able to facilitate visits to the Netherlands by some teaching staff members of the Building Technology departments to observe and learn about modern trends in the industry. The staff of the involved departments will thereby achieve the competence to review the current curriculum and to develop and implement a revised curriculum (including relevant software applications). For this purpose the TU/e provided support in the following:

The Ghanaian staff member was twinned with a TU/e expert as well as with experts of the Kwame Nkrumah University of Science and Technology KNUST. At KNUST the PT staff will be trained up to BSc or MSc level. The TU/e expert will supervise the development of the course as well as the writing of the course books. The latter will also be done in consultation with the KNUST staff. TU/e experts will jointly with the PT staff introduce the developed BSc course as part of the revised curriculum. Most of the staff will take either a BSc or an MSc course at the KNUST at Kumasi by means of tailor made summer courses. Additionally they come to the Netherlands for their practical training during their studies.

3.4 Upgrading of directors to phd level

Two staff members have started their PhD study at the TU/e in the Netherlands, while part of the PhD field work will be carried out in Ghana, in a so called sandwich mode and locally supervised by a KNUST supervisor in close collaboration with the TU/e PhD supervisors.

One of the selected phd candidates turned out to be incapable to do such a Phd-study. Reasons were the pre-selection of the candidate and his attitude. Before a new candidate again has been put in place takes some time. As a consequence the targeted phd graduation will be delayed and, so the requirement of the accreditation board that at least the head of school shall be phd graduated cannot be satisfied at the right moment.

4 Conclusions

The set-up seems to be something that works. Even better than compared to other NPT projects. Because we involve all participants in all the matters and in transparency.

5 What is the significance to sustainable development

The idea that a healthy CI is important for a country to make investments possible and to house people in a proper way.

The basis again therefore is a good education system, which begins with the primary school etc. and further on the polytechnics.

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