Using Soft Systems Methodology to Plan Advanced Academic Programs in Post-Harvest Technology in Thailand

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Abstract

Academic programs operate in organizational environments that are not constant and are influenced by a multitude unstructured factors characteristic of human activity. Soft Systems Methodology (SSM) (Checkland, 1981) is of potentially great significance to address complex issues in these environments, and is designed as a means of moving from finding out about a given situation to taking action to improve the problem situation. This paper reports how the Soft Systems approach was used in designing and implementing advanced degree programs in Post-Harvest Technology at King Mongkut's University of Technology-Thonbuir (KMUTT), Bangkok, Thailand. The authors describe and discuss the results obtained during each of the seven stages of the SSM process: 1. Inquire into the situation; 2. Describe the situation; 3. Define the human activity system; 4. Conceptual modeling; 5. Compare the conceptual model with the real world; 6. Debate desirable and feasible changes; and 7. Implementation. As a result of the process, a revised Master's degree and a Ph.D. program in Post-Harvest Technology are now being implemented.

Key words: Soft Systems Methodology; Post-harvest Degrees; Training; Academic Programs

Introduction

Academic programs, research, and service, are the lifeblood of colleges of agriculture, faculty, and related programs. These programs are closely linked to the institutional purpose. Revenue generation for research as well as demonstration and skill training activities are integral functions of degree granting programs. Conflict often arises from within or between institutions or with external agencies or clients over the purpose, design, or function of academic programs. This conflict is often expressed in differences in opinion relating to commercial realty and how to maximize educational benefit and utility.

Academic programs operate in organizational environments that are not constant. Changes in the environment include a mayoral of physical, natural, and economic factors, as well as a multitude of unstructured problems that are characteristic of human activity. Problems associated with purpose, design, and implementation of an educational program, are typically *soft* problems. In organizations soft problems are typically concerned with both *what* an appropriate activity is and *how* an activity should be undertaken. *Soft Systems Methodology* has been developed as a process of analysis based on the concept of a human activity system (e.g., program). It is designed as a means of moving from *finding out* about a given situation to *taking action* to improve the problem situation (Checkland, 1981).

This paper reports the results of using the Soft Systems approach to designing and implementing advanced degree programs in Post-Harvest Technology at King Mongkut's University of Technology-Thonbuir (KMUTT), Bangkok, Thailand.

Soft Systems Methodology (SSM)

Soft Systems Methodology was developed by Peter Checkland and his colleagues at Lancaster University (Checkland, 1981) (Figure 1). It is of potentially great significance in dealing with the multitude of unstructured, interdisciplinary, and complex problems that characterize human activities and environments.

Naughton (1981) gives an overview of this methodology in which he states that it is based on the assumption that a real-life "mess" might contain hundreds of problems and that the idea of problem solution for the situation as a whole is a "Utopian dream." The analysis phase is therefore conceived of not as an attempt to arrive at some objective or reductionist understanding of the problem, or a proposal of solutions, but as a phase during which different perceptions of the situation as a whole may be identified, represented, and communicated. At the final stages of the process, the "researcher" is expected to participate with stakeholders in effective action (e.g., initiate positive change) rather than simply presenting them with a list of recommendations for action. This means that the "researcher" is also a part of the "problem" environment and a stakeholder (actor) in the process.

The methodology is a system one because of the significance of the concept of a relevant system within it. Once the researcher has explained the problem situation (see stage 1 and 2 of Figure 1) and realized which aspects of the situation s/he needs to analyze further, s/he is required to envision an organized and efficient way of improving it, or perceive it in a different light as a relevant system (see stages 3 and 4 of Figure 1). This system is then developed through the application of systems thinking to defining it and building a conceptual model of it (stages 3 and 4 of Figure 1). The comparison of the model with the actual situation (real world) (see stage 5 of Figure 1), and the insights this provides, are the basis of a debate about desirable and feasible change among stakeholders (see stage 6 of Figure 1), and of the end goal, effective action and improvement of the problem situation (Checkland, 1981).

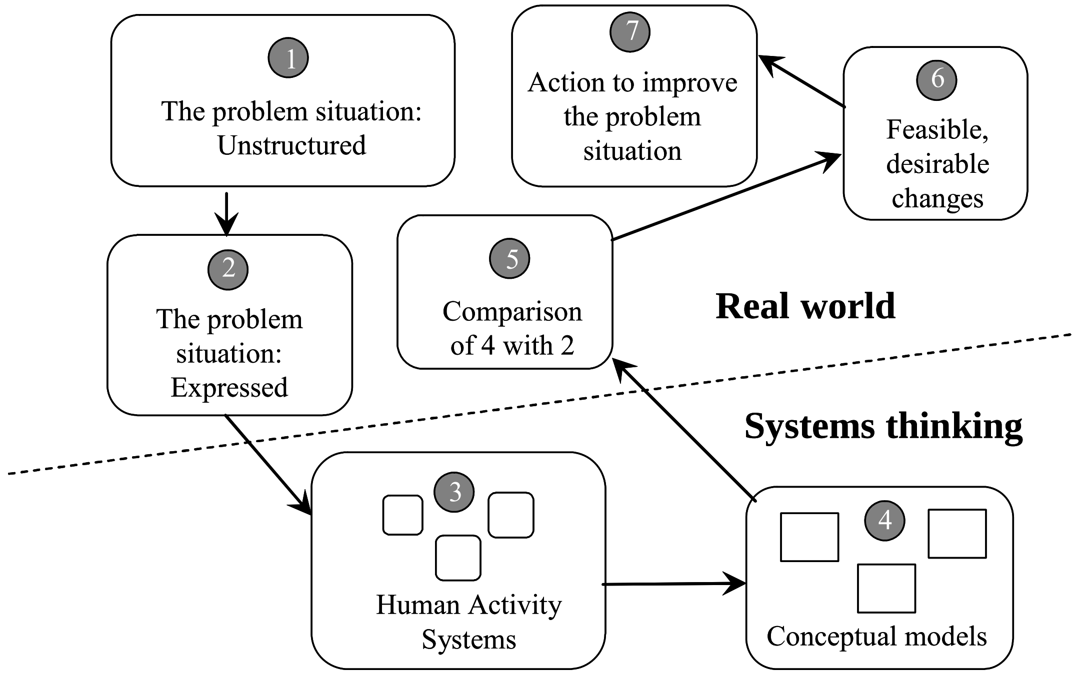

Figure 1. Soft Systems Methodology. (Source: Checkland, 1981).

The methodology has been found to be very useful to address real-world problems of agricultural programs (Bawden, Macadam, Packman & Valentine, 1984), characterized by their complexity and multidisciplinarity. It is consistent with innovation processes in agriculture and the interactions between the social, technological, and natural systems involved. It stresses the need for linking human relations best understood by social scientists, with the creative, perceptive, and intuitive mode of thinking often thought of as the province of the artist, as well as the logical, linear, and sequential thinking which characterizes the thought process of many scientists (Samples, 1976; Vickers, 1981). It is a technological methodology in that its primary goal is to accomplish practical and meaningful improvements – the facilitation of beneficial change in problem situations -- rather than understanding for understanding's sake.
The seven stages of Soft Systems Methodology are: 1. Inquire into the situation; 2. Describe the situation; 3. Define the human activity system; 4. Conceptual modeling; 5. Compare the conceptual model with the real world; 6. Debate desirable and feasible changes; and 7. Implementation. A brief description of each stage follows (Checkland, 1981):

Stage 1 – Inquire into the situation (Checkland, 1981)

The approach to analysis of problematic situations used most frequently is to start by identifying the problem. In the Soft Systems inquiry approach, this is exactly what the researcher should not do, because the majority of situations s/he will encounter do not have one problem, but are rather a much more complex series of situations with multifaceted problems that are interconnected with each other. Moreover, these problems may not be easily understood at the beginning of the process. The main objective of this stage, therefore, is to identify and study in-depth the perspectives of people in a particular situation and environment. Any techniques (brainstorming, interviews, participant observation, focus groups, document review, etc.) used to do this should help the researchers describe thoroughly the situation and the environment rather than isolate the problem or prioritize problems.

Stage 2 – Describe the situation (Checkland, 1981)

The main task for this stage is to help the stakeholders rationalize their environment and the main topics of concern or issues that need to be dealt with, as well as identify a range of possible and relevant strategies for improvement. In this stage the information gained from all sources is integrated in a comprehensive report on the situation. These reports are often written and shared with key people.

Stage 3 – Define Human Activity Systems (HAS) (Checkland, 1981)

The major activities in this stage involve defining relevant systems by using Smythe and Checkland's (1976) CATWOE, a mnemonic that lists the six items to be included in it. CATWOE forces one to articulate assumptions, particularly the worldview of all the stakeholders involved in the process. CATWOE provides the root definition for the Human Activity Systems involved. A summary of CATWOE questions is provided on Table 1.

Table 1

Summary of CATWOE Questions: Six Items Covered in a Well Formulated Systems Definition (after Smythe and Checkland, 1976)

Customers *C*	=	Who could benefit from this altered way of doing things (as summarized in our transformation statement) – "beneficiaries"? Who could be adversely affected – "victims"?
Actors *A*	=	Who would manage and be responsible for the improved operation as summarized in the transformation statement?
Transformations *T*	=	What could be a central transformation process that characterizes an improved operation? How might we best summarize the operation of coordinated activity represented in an improved state? (Formulate a separate system definition for each transformation.)
Weltanschauung *W*	=	What is the outlook, mental framework, or image that makes this particular transformation meaningful? What values and assumptions are explicit or implicit in our view of improvement as described in our transformation statement? (If there is more than one associated with a given transformation formulate a separate system definition.)
Owner *O*	=	Who has or could be granted the power to alter or stop the proposed transformation process, and hence the group's sense of improvement, even in the future?
Environment *E*	=	What environmental factors might constrain and assist our improved operation in the future? And what are the *internal or organizational* constraints?

Stage 4 – Conceptual Modeling (Checkland, 1981)

In this stage a conceptual model is developed based on CATWOE. A premise of Soft Systems analysis is that models are used to present a set of human activities in a way to illustrate what kinds of human activity would occur in an improved state. In Soft Systems, a Human Activity Systems model is always developed because agricultural and natural resources management is conceptualized as a human activity system with people involved (farmers, growers, ranchers, agribusiness personnel). The purpose of this stage is to have stakeholders involved in the process thinking deeply and creatively about how things might operate in the future, but without a commitment to actually implementing any of the changes.

Stage 5 – Compare Conceptual Model with Real World (Checkland, 1981)

During the comparison stage, specific proposals for change are tested by comparing the conceptual model(s) to the real world picture of the situation developed in stages 1 and 2. The ultimate objective of this stage is to prepare the conceptual model(s) for presentation to all stakeholders, including preparing and developing appropriate communications and debate.

Stage 6 – Debate Desirable and Feasible Change (Checkland, 1981)

The comparison and debate stages have much in common in that both aim to test the conceptual models developed in stage 4 and contrast them with the situation expressed in stage 2. Also they both show full participation, learning, and communication between all stakeholders, as compared to the expert to client approach (advice-giving and recommendation-receiving) (Wilson & Morren, 1990) so often criticized in the analysis of diffusion of innovations (Rogers, 2003). This stage looks forward, taking the recommended changes of the model and discussing if they are needed and workable. In Soft Systems terminology (CATWOE), desirability refers to the W (worldview, from the German Weltanschauung), attempting to take into account the perspectives of all those involved in the process and debate, and the feasibility of the change refers to the E (environmental and internal constraints).

Stage 7 – Implementation (Checkland, 1981)

The main tasks of this stage include designing a plan to carry out specific actions, communicating the specifics of the plan to all stakeholders affected (actors), monitoring performance and the environment, and evaluating results. As a result, some modifications in the plan may be necessary. In Soft Systems language this stage operationalizes the Human Activity Systems (HAS) model.

Purpose of the Paper

The purpose of the paper is to report the results of using the Soft Systems approach to plan advanced academic programs in post-harvest technology in Thailand.

Methods and Data Sources

This paper uses a case study resulting from using SSM to design and implement advanced degree programs in post-harvest technology at King Mongkut's University of Technology-Thonbuir (KMUTT), Bangkok, Thailand (Post-Harvest Technology [PHT] Program). Particularly, the authors describe and discuss the results obtained during each of the seven stages of the SSM process: 1. Inquire into the situation; 2. Describe the situation; 3. Define the human activity system; 4. Conceptual modeling; 5. Compare the conceptual model with the real world; 6. Debate desirable and feasible changes; and 7. Implementation.

Results and Products

Soft Systems approach was used to designing and implementing advanced academic programs in Post-Harvest Technology at King Mongkut's University of Technology-Thonbuir (KMUTT), Bangkok, Thailand. The results of each stage of the Soft Systems process approach are provided in the following sections.

Stage 1 – Inquire into the Situation

The situation was one in which post-harvest losses of agricultural commodities loom large and have been recognized since the Sixth National Economic and Social Development Plan (1987-1991) of Thailand (National Economic and Social Development Board [NESDB], 1987). Losses of durable and perishable commodities are estimated to be 10 and 20-40%, respectively, worth over $500 million annually. Attempts to reduce these losses were stated in the subsequent plans. In order to reduce losses and maintain quality of the commodities, qualified manpower in the field of Post-Harvest Technology, which is integrates engineering, agriculture and biology knowledge, is urgently needed. Moreover, to enable Thailand to gain a strong position and reputation in the highly competitive world market in the future, highest quality standards for commodities must be ensured. These requirements lead to a major demand for advanced research in the areas of quality analysis and post-harvest handling system of Thailand's agricultural commodities (Ministry of University Affairs, 2000).

A panel was formed consisting of representatives from all segments of the post-harvest industry (university faculty and administrators, growers, industry, marketing, and government agency personnel). Panel members reviewed relevant documents and interviewed additional administrators and industry representatives, and then convened for discussion and deliberation.

Stage 2 – Describe the Situation

Thailand needs for professionally-trained manpower in post-harvest technology are great. PhD graduates should meet the accepted international standards for this degree. The program should also aim to encompass the technological needs of Thailand and the region. These needs include not only the generation of new knowledge, but also the ways and means by which this knowledge will be extended to all levels of the production and market chain for grain, fresh produce, and ornamentals.

KMUTT is uniquely placed to develop an innovative program that will distinguish it among other Universities in the region, given the excellent laboratory facilities under construction at the Bangkhunthien campus. It was noted that the head of the Division of Post-Harvest Technology will be functioning with a skeleton staff of relatively inexperienced people until the five staff members undertaking PhD studies at overseas universities return. Then, the team will have an excellent range of skills. These young staff members will gain much from a program of Visiting Scientist who should be a attracted to work in the modern, well-equipped laboratories at Bangkhunthien. This should help KMUTT to rapidly build regional and international recognition and assist in achieving international recognition of its PhD graduates in PHT. Concern was expressed about the future employment prospects for PhD graduates. It has been said that one objective is to provide academic staff to raise the standards of Technological Colleges with the object of improving teaching of modern production, distribution, storage, and marketing systems for primary produce in production regions. Concerns relating to the need for training in teaching and learning processes was expressed, since most PhD candidates lack teaching experience. Positions in traditional agencies such as the Universities and Departments of Agriculture will most probably be limited, so most graduates will need to seek employment in private industry. The selection of PhD topics and co-supervisors, and cooperation arrangements with the private sector, will be paramount in ensuring that PhD graduates will be valued by the private sector. Well-trained graduates should be able to move easily between the public and private sector during their careers.

Stage 3 – Define Human Activity Systems (HAS)

The Human Activity System and the resulting root definition is as follows: A system owned and operated by the post-harvest technology unit where faculty prepare students through academic programs where knowledge and experiences enable graduates to improve post-harvest systems within the limitations imposed by university regulations, industry support, and economic health of the region. Table 2 presents a summary of CATWOE questions for this system.

Table 2

Human Activity Systems for Post-Harvest Technology: Summary of CATWOE Questions (Checkland, 1981)

Customers *C*	=	Post-Harvest Businesses
Actors *A*	=	Faculty and Students
Transformations *T*	=	Students gain knowledge and experience to improve post-harvest systems
Weltanschauung *W*	=	Post-harvest systems can be greatly improved via an academic degree program
Owner *O*	=	Post-Harvest Technology unit at KMUTT
Environment *E*	=	University regulations, industry support, economic health of region

Stage 4 – Conceptual Modeling

A basic model of a post-harvest technology academic system grew out of the CATWOE framework. This stage focuses participants' attention on the fact that post-harvest technology is a human activity system with people involved and illustrates how a degree program or academic system model might look and operate. Figure 2 presents a partial conceptual model of the types of relationships and interrelationships between the major actors, owner, and customers of the system.

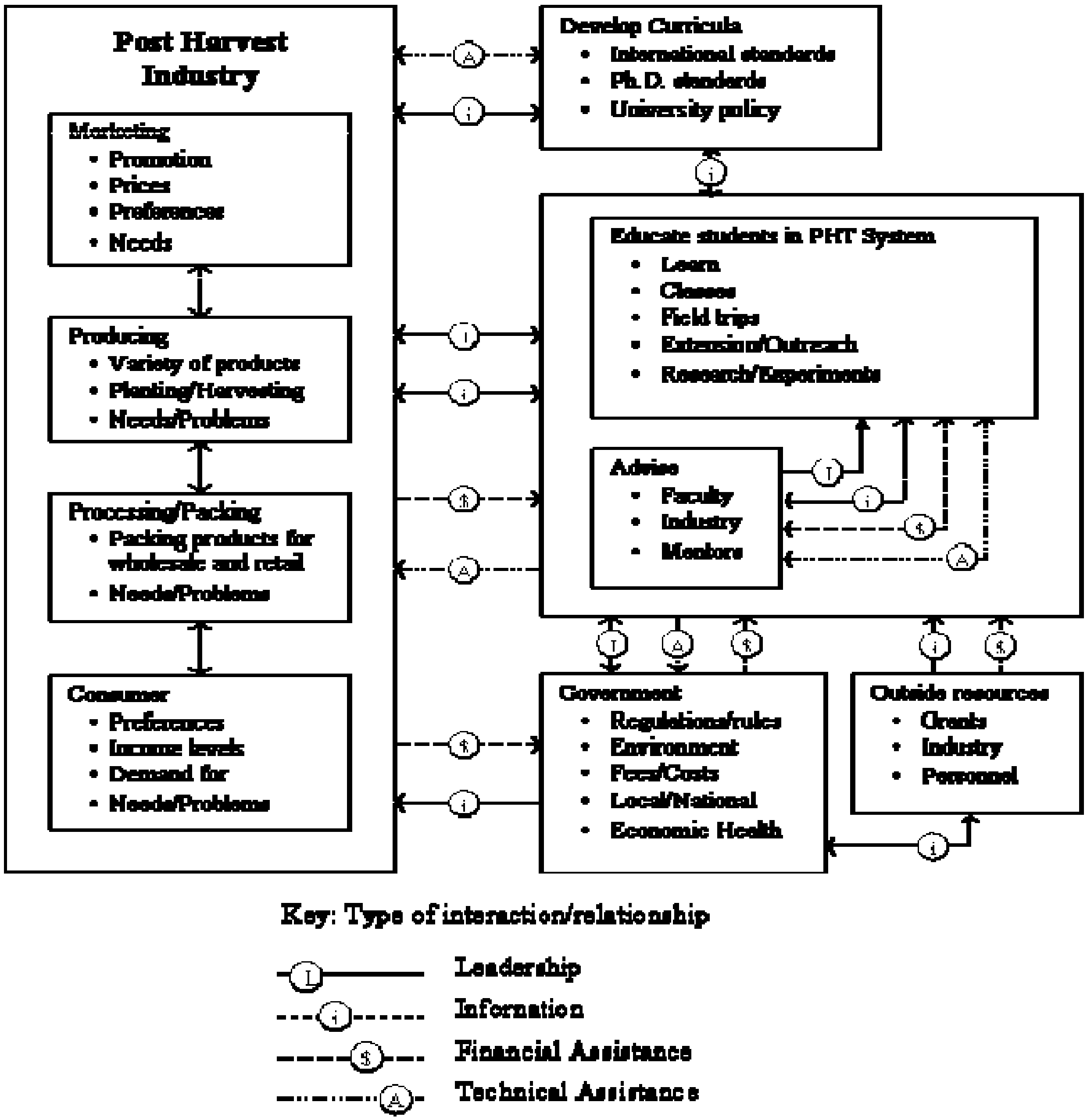

Figure 2. Partial conceptual model of post-harvest academic system and interrelationships with owner, actors, and customers.

Few individuals involved in post-harvest technology are professionally trained to examine the human relationships that are needed to improve situations or solve problems. Rather, these individuals have been trained and excel in their subject matter disciplines and may tend to overlook the inter-relationships that exist between groups. Becoming aware and taking into account such inter-relationships may represent a paradigm shift and a profound challenge, but will help people in academia address problems with a holistic perspective, and better manage and improve their (post-harvest) systems (Patterson, 1998).

Stage 5 – Compare Conceptual Model with Real World

The emphasis in this stage was on the comparison of what could happen with what is happening. A review of documents and discussions with students, industry personnel, and post-harvest experts revealed that the current graduate programs needed revising and upgrading. As a result, it was proposed to develop new curriculum for the MS program providing more opportunities for experiential learning. This was considered necessary because many students attracted to this program have little practical experience in any aspect of the farm to plate chain and it would also strengthen the applied technology component of the degree. Also, it was proposed to reduce the research component of the degree to allow students to complete the degree in the designated three semesters. The need for the Division of Post-Harvest Technology to publish its research outcomes should be enhanced by the establishment of Research Masters and PhD degrees. It was also recommended that there should be a continuum of awards with various requirements for course work commencing with students with a 4-year degree with a first class Honors or a taught Masters proceeding to a MS of research or a PhD. A graduate Diploma could also be included to recognize students who wish only to complete the course work component of the taught Master's program. The need for a PhD program was highly recommended by the participants (actors). The following outcomes were agreed on concerning the development of a traditional PhD:

1. It was proposed to improve the curriculum for the Master's degree in PHT and to recognize this degree as a pre-requisite for advanced research degrees. It was also recognized that these changes would have to comply with the Thai national regulations for higher education. In the case of PhD's, there is a requirement for a one-year qualifying period and formal examination before the students are confirmed candidates in the PhD program. The panel agreed that this first year should include specific advanced courses that will help prepare students for advanced research and to remedy deficiencies in technical subjects relevant to their chosen research topic.
2. MS and PhD committees should include suitable advisors from the public sector. This was considered desirable to help build links with the private sector and to access advice and possible resources not available within KMUTT.
3. International and Thai Universities follow various practices for the examination of PhD dissertations. Overall it was agreed that at this time KMUTT should consider engaging external examiners including internationally-recognized faculty to ensure that high standards are achieved. The option of an oral defense should also be retained where practicable or where the topic lends itself to direct presentation to the private sector in Thailand.
4. Existing and new exchange agreements should be utilized to internationalize the PhD program. One example is a sandwich arrangement in which a joint degree is issued in KMUTT and the University of Western Sydney (UWS). According to the proposed agreement a Thai national student would be registered with KMUTT and would spend some time at UWS working on her/his research topic. Thai students would receive their degree under the regulations of KMUTT. The reverse situation would apply whereby a chairperson from University of Western Sydney and a member of the KMUTT academic staff would jointly supervise University of Western Sidney students.

Stage 6 – Debate Desirable and Feasible Change

During this stage discussion centered around the worldview (W) or mental framework and the environment (E) in which post-harvest students will work. As a result of several discussions a Professional Doctorate in PHT was proposed. The idea for this degree arose from observations by panel members that traditional PhD graduates are often ill-equipped to extend and apply technical knowledge to practical users including growers and are not versed in systems thinking, business management skills, and human resource management. It was suggested that graduates trained in hard systems degrees such as the taught Masters in PHT who had a desire to take a soft systems approach to improving industry would be candidates for this new degree. It was noted that this degree is awarded in some Australian Universities to recognize advanced achievements in fields such Education and Health Studies that do not lend themselves to a traditional research PhD.

There was a general support for further exploration of the feasibility and possible demand for such a degree. In the meantime students have the opportunity to add an MBA to an existing degree that would cover human resource (project) management and business. The International Committee that met previously proposed a joint BM-MBA degree that could eliminate a perceived gap in Human Resource education in Thailand.

It was recommended that research topics including a strong emphasis on systems thinking and methods should be included in the new KMUTT PhD program if suitable supervisors are available. Joint arrangements with international universities with high standing in this area could enable incorporation of this area of academic activity into Post-Harvest Technology at KMUTT.

Stage 7 – Implementation

Before the changes and recommendations could be implemented they had to be validated by university administrators and faculty. Based on the conceptual model and its comparison with the real situation, along with strong support from industry personnel, university faculty, and administrators, the revised Master's degree along with a PhD program in PHT have been endorsed. With the return of seven new faculty holding PhD's in PHT new courses could be developed to implement the new programs. Continuing pursuit of the program's objectives will see further improvement in the post-harvest programs as a significant contributor and leader to the educational programs of KMUTT and the Southeast Asian Post-Harvest Technology consortium.

Conclusions, Educational Importance, Implications, and Applications

Soft Systems Methodology is a simple seven step process that can be used by agricultural and extension faculty to address complex agricultural issues and plan programs. Most faculty involved in teaching, research or extension excel in a subject matter discipline that does not include training on program development theory, concepts or related principles. Thus, the importance of involving people throughout the entire process may be overlooked. The Soft Systems process helps to insure that the people component remains a key element of the planning, development, and implementation processes. While this example illustrated the development of a Post-Harvest graduate degree program, the same process can be used to address dynamic situations in agriculture where the introduction of a technical package or the redistribution of resources to correct or improve a situation does not have a straight-forward solution.

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