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Whole Systems Inquiry: Designing Large Educational Events

Abstract
Whole systems inquiry (WSI) helps people see complex topics as functional activities with inputs, outputs, interactions, and performance of the system over time. The authors used WSI to design a national symposium with 800 attendees who responded to two questions at the end of 70 topical sessions. Responses were aggregated onto a mega-map, synthesized into themes, and drawn as an emerging system. Work groups compared emerging themes with national priorities while individual participants evaluated utility in their disciplinary programs. We conclude that large meetings can be designed as functional systems with participation, synthesis, and evaluation of intentional learning.

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Introduction

Designing large meetings, symposia, and conferences as dynamic, functional systems are challenges for Extension educators and meeting hosts, regardless of topic, discipline, or program. Similarly, attendees expect the meeting to be engaging, presenters anticipate enthusiastic listeners with discussion, and administrators authorize travel expecting novel ideas or applications. Typical meetings such as symposiums often have a common theme, but topics become lists of concurrent sessions rather than a network of topics that relate information and learning.

The authors describe the redesign of a typical symposium format using principles of whole systems inquiry (WSI), participatory learning, and assessment. This article is organized within the context of the symposium and represents how attendees experienced the meeting with literature citations discussed within the context of the redesign. Extension educators, engineers, and doctors find this approach comfortable because they typically are "doers" who solve problems validated with science (Kolb, 1984).

Methods/Results

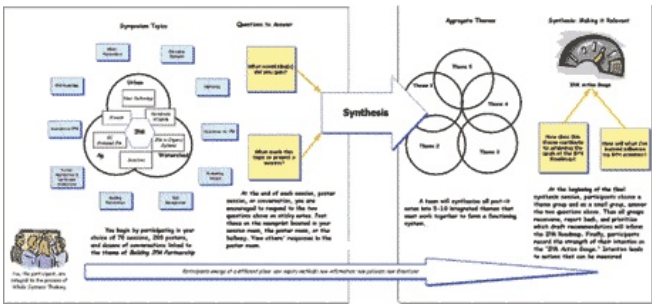
Organizers of the 4th National IPM symposium held in Indianapolis, Indiana, April 8-10, 2003 invited the authors to design the symposium into a participatory format using WSI principles. The theme "Building Alliances for the Future of IPM" advertised 18 topics, 70 breakout sessions, 230

papers, 560 posters, and two plenary sessions with 800 attendees during two and a half days.

1. Redesign objectives included:
2. Create a roadmap of symposium topics using principles of WSI,
3. Invite attendees to engage in the system,
4. Synthesize individual insights or remarks from each session into emergent themes for discussion, and
5. Measure personal intention to utilize ideas in disciplines and/or aggregate data for emergent themes to enhance state and national priorities.

IPM functions as a whole system even though most people focus on individual pests, pest systems, disciplines, or topics at a symposium. First, we combined the 70+ topics into 18 themes defined as inputs (themes, topics, people presenting papers, etc) and printed in the program as a roadmap (Figure 1) to represent WSI. Second, meeting inputs were transformed into outputs (information, ideas, contacts for future reference) while feedback loops (space, time, or mental capacity to absorb information) regulated system performance or function. Third, systems produced results measured as outcomes and consequences (new applications, intentional learning, behavioral change). In this case, we measured results at both the individual and aggregate state and national levels.

Figure 1.
Whole Systems Thinking Applied to IPM



Attendees chose topics both from a list and the roadmap or diagram printed in programs. After each topic or session, attendees were invited to respond to two questions, "What novel idea(s) did you gain?" and "What made this topic or project a success?" Responses were posted by attendees on sticky notes within topic rooms, collected, and synthesized into common or emergent themes (Glasser & Strauss, 1967) using modified concept (Novak & Gowin, 1984) or mind mapping (Buzan, 1983) techniques. The process was dynamic, active, participatory, and intentional, with emergent themes posted to a "mega-map" while concurrent topics continued.

Attendees wrote hundreds of comments during the first 24 hours following the plenary session. Most topics generated 20+ sticky notes for an estimated 50% response rate. Perhaps 60 attendees expressed curiosity by wandering past the "mega-map" or drew and commented directly on the map by adding feedback loops, personal perspectives about the topic or process, or drawing personal conclusions about the process and techniques.

Individuals responding to one or both questions about "novel ideas" or "topic success" either confirmed their learning or generated additional ideas. Their summaries described new IPM projects, alliances or partnerships, measures and integration, integrating social sciences and learning methods, new ways to reach audiences, and many other topics of interest to respondents. Overall, responses seemed to confirm the notion that expectation could be aggregated on a "mega-map" and synthesized within a symposium format.

Perhaps the most challenging step was synthesizing emergent themes for the final plenary session from the hundreds of comments posted for each session and the summaries that emerged on the "mega-map," given a limited timeframe. Four topics emerged, each confirming central themes of the symposium, as follows: 1) partnerships & alliances, 2) education, 3) research), and 4) evaluation. We hypothesize that evaluation was added as a result of frequent comments about systemic feedback loops and measures of success or learning made by authors throughout the event.

Themes were matched with three foci from the "The National IPM Roadmap," including a) commercial agriculture, b) natural resources, and c) urban/public settings. About 300 attendees selected one of 12 matrix topics to answer, "How does this theme contribute to achieving the IPM Roadmap goals?" Facilitators synthesized recommendations for the final report to the plenary session (Table 1).

Table 1.
Comments Summarized by Discussion Leaders at Final Plenary Session from 166 Cards as a Result of Synthesizing Emergent Themes from Individual Sessions on a Mega-Map Combined with IPM Roadmap Foci Based on a Whole Systems Inquiry Process

	E M E R G E N T T H E M E S			

Roadmap Focus	Partnerships & Alliances	Education	Evaluation	Research
Commercial Ag	• Build on existing partnerships • Identify common tasks that individuals can't do alone; develop action plan • Find funds/resources needed for complex process of establish/maintaining partnership • Identify links in chain; action steps • Consider social/political levels of collaboration	• Education system integrates sciences including ecology, stakeholders, delivery systems including distance, and promotion including National Geographic to reach broader audiences • Step-by-step IPM with self assessment tools; adapt to local farms; incentives • Reach rural, commodity groups, EPA, etc.	• Design IPM evaluation system that includes: ◦ GIS/simple sampling tools ◦ economic, health, environmental, water quality assessments ◦ neighbor and regional scales ◦ communication system ◦ more qualitative measure ◦ help IPM/users with evaluation and ◦ standardize/aggregate results	• Begin with stakeholder input • Multi-disciplinary team (pest discipline, farmer, PCA's, and social scientist) • Need efficient/useful tools (sampling, information/data management, networking) • Plan FUTURE research (proactive) • On-farm demonstrations • Keep communication open - new input
Natural Resources	• Reconnect with existing partners • Connect with new partners • Use old partners to identify new partners • Be specific on tasks, broad on finding people • These are universal across rows and columns	• Viewed as education/ coordination across agencies ◦ integrate BIA/BLM, FS, etc. ◦ core courses with regional/local application; could be e-Extension ◦ Team with writers, graphic artists, marketers to develop modules, etc. • IPM in school, public broadcasting/become commentator • Including Land Trust Alliance, Nature Conservancy, WWF, etc.	(no attendance)	• Develop detection systems for invasive pests • Increase bio-control and management • Proactive to assess impacts such as runoff of new pesticides • Study wild lands effect on ag pests • Develop interdisciplinary collaboration
Urban/Public	• ID potential partners • Create partnerships around a clear common purpose and/or projects • ID clear roles for all partners; acknowledge contention; and identify common ground • Make quality partnerships • Raise level of coordination of urban IPM issues on a national level	• Consumer education at point of sale • Partner (people/programs with related interests/missions such as school, 4-H, Scouts, PTA, Youth programs, etc.) • Provide awards/recognition	• Ask urban stakeholders (schools, landlords, pesticide companies, etc.) what key questions/needs design indicators/metrics • Measure understanding of IPM with school children • Metrics of social cost/benefits needs development for urban; public health end point such as "How does mosquito surveillance mitigate threat?"	• Need focus on community-based IPM with pest biology/ecology, spatial scales and movement/dynamics • Establish risk/benefit, chronic/acute exposure for urban pesticides • Create urban advisory group; set priorities for region

Results generated by the synthesis groups confirmed both the goals of the event and the IPM Roadmap (Table 1). Of the 166 cards generated in the final plenary session, 52% aligned with the Partnerships & Alliances theme, with most comments in Research and Education topics. Remaining respondents commented about the need for whole systems in IPM (9% of respondents), evaluation (14%), and adoption before/after (18%). Ideas confirmed IPM networks among diverse stakeholders including shared resources, electronic monitoring and pest reporting, eco-based habitat, and integration of program monitoring/metrics. One group of cards described a farmer

database of success stories while another group mentioned networking with public health and other community experts.

As attendees departed the final plenary session, they were asked to refocus their analysis toward personal learning intention by answering, "To what extent do you intend to use the knowledge or ideas gained from the symposium in your own program?" About 50 attendees placed sticky DOTS (Lev, Smith, & William, 1995) on the "IPM Action Gauge" located near exits. DOTS (delta over time) suggests intention to use ideas gained during the symposium measure as a "tank of ideas" being half to three-quarter full.

Discussion of Whole Systems Inquiry (WSI) Applied to Large Meetings

Consider for a moment that people do whole systems thinking every day of their lives. Daily tasks or activities are identified, progress monitored, and decisions modified based on feedback loops that regulate and improve overall function. Results are aggregated at the end of the day and soon become routines, except when disruptions occur that create new cycles of activities and reorganization. Even though people have practiced systems thinking for centuries, it's interesting that the science of systems thinking and practice emerged only about 50 years ago, when scientists began testing hypotheses and developing a general systems theory (Ackoff, 1974; Bateson, 1972; Bertalanffy, 1975; Churchman, 1968; Habermas, 1973).

WSI begins with the whole, considers function and behavior, and traces the flow of activities, resources, or logic through systems diagrams (Figure 1). Systems transform inputs into outputs regulated by feedback loops and interactions within and between scales (Ackoff, 1974; Senge, 1990). Systems exhibit behaviors as growth, decline or death, oscillation, or stability (Sterman, 2000), often functioning this way for extended periods until the system exhibits renewal or what is termed "creative destruction," where resources are released and reorganized into a new or different system (Holling, 2002). Systems that cycle into renewal may be provoked by innovations or novelty loops that create change, thereby prompting responses by attendees to the question, "What novel ideas did you gain from the presentation?"

Learning and whole systems inquiry imply a *tension* between what is known and what might be known. Conceptually, the symposium theme, "Building Alliances for the Future of IPM," suggests a *tension* between current reality and a vision expressed by organizers (Senge, 1990). Inviting attendees to answer two questions after each session represented a variation of the Socratic method that asks a "yes/no" question followed by an immediate *expectation* of answering "why?" Responses on sticky notes were compiled using cultural domain analysis with free listing, nominal group (Morgan, 1983; Krueger, 1994), and cluster analysis (Bernard, 2002) techniques to explore cognitive domains and how people think and locate meaning in the world around them. Both the WSI process and personal aspects of answering questions were intended to create a *tension* and *expectation* among attendees.

Organizational design at large events such as symposia often are planned for efficiency rather than developing learning *tensions* or engaging people in a variety of learning styles and preferred learning approaches (Kolb, 1984). Some people learn better by talking in hallways or in groups, others listening to organized presentations, still others when stimulated by hunches or hypotheses, and others with active engagement or hands-on activities. Although questions and responses on sticky notes were similar, we asked attendees to respond following sessions, hallway discussions, mulling time, or at the mega-map. Our purpose was to shift the ownership of learning to the learner while honoring personal learning approaches and preferences.

Learning often is defined as changes in behaviors, attitudes, or beliefs. Behavioral change requires learners to explicitly state personal *intentions* to learn followed by intention to change (Trotter & Schensul, 1998; Mazmanian, Daffron, Johnson, Davis, & Kantrowitz, 1998). The *intentional* design of this symposium invited attendees to respond personally to two questions following each session and again as they departed the final plenary session. At each door, an IPM Action Gauge asked each person to record the strength of their intention to use the ideas or information gained from the symposium by placing a DOT or commitment on the poster. This exercise represents a feedback loop to encourage personal reflection on the topics, information presented, science, and practice of IPM as well as bringing "closure" to the symposium as attendees departed for home.

WSI suggests that learning ought to occur and aggregate beyond the individual at the whole system level. Our *intentional* design synthesized responses by individuals into emergent themes (Glaser & Strauss, 1967). The theme partnerships and alliances (Table 1) emerged as expected from the symposium theme, "Building Alliances for the Future of IPM." However, research and education focusing on partnerships rather than IPM practices and the topic of evaluation represent themes that emerged from this process. By creating an *intentional* design to link emergent themes with the IPM Roadmap foci seems to confirm the science of WSI as a process to link individual actions or intentions to achieve an aggregate set of priorities or intentions at a program, state, or national level.

Conclusion

Overall, we concluded that a large educational event such as a national IPM symposium could be redesigned as a functional, participatory learning system. Emergent properties or themes through all topics for future consideration included integrative systems that blend disciplines, sciences, people, and resources to deliver subject matter topics such as IPM. Achieving this goal can be enhanced with integral and functional systems across a broad scale of ecosystems, applications, and social agendas.

WSI provided a conceptual framework and science to redesign the symposium while recognizing the internal dynamics, complexity, and adaptability of systems. Perhaps the question is, "How do we research and manage dynamic systems that adapt over time?" Inherent in this question are blends of causal and functional flows of resources that must be considered within a hierarchy of interacting systems. Similar dynamics were evident during the symposium in that some topics contributed certainty while others considered alliances, all for the future of IPM at global and local scales.

WSI asks the question, "what structures or functions need to be modified to achieve the desired outcomes?" Several national funding sources describe *systems* as a goal, while the IPM Roadmap suggests a systemic quality or measure. Farmers recognize their enterprise as a functional system with internal feedback loops, hierarchies, and behavior. Scientists and educators mention systems with expected outcomes, possible consequences, and feedback. People often identify daily routines as systems, when asked. Perhaps the need is to make systems thinking intentional as a set of practices based on basic principles of systems thinking and practice. That is exactly what we tried to do during the symposium and writing this article. By making the ideas and concepts explicit, Extension educators can test assumptions and hypotheses with the intent to improve our research, education, and practice in designing educational systems and meeting formats.

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