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The Factors Enabling and Inhibiting the Development of Agricultural Internet Virtual Communities: An Australian Case Study

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Abstract – This paper outlines the results of a literature survey and a case study in which factors enabling and impeding the development of Agricultural Internet Virtual Communities (AgIVCs) were identified. These factors were incorporated into a model which extends the work of Romm and Clarke.

I. INTRODUCTION

Virtual Communities (VCs) are relatively recent phenomena of interest to eCommerce researchers. A consensus on the definition of VCs, however, has not been reached [1]. A common approach to this problem [see, for example, 2, 3-5] has been to focus on their characteristics, which predominantly include:

- a group of members (which could be individuals or organisations);
- a distinctive focus;
- member-generated content and information;
- the provision of information and/or resources relating to the VC's distinctive focus; and
- a computer-mediated method by which members communicate and obtain information.

The Internet is growing in popularity as a means of facilitating VCs [see 6]. Internet-based VCs (or IVCs) often make use of tools such as email, the Web and other Internet-driven applications to enable communication between its members and/or to aid in the provision of an IVC's information and resources.

We have contributed to a small but growing body of empirical IVC research by conducting a case study looking at the factors enabling and inhibiting the development of an Australian IVC with a distinctive focus on agriculture (that is, an AgIVC). The members of the AgIVC were primarily farmers in regional Australia. As such the AgIVC studied tended to have an agricultural business focus, rather than a general interpersonal-based regional community orientation.

In commencing this research we found that there was no comprehensive model of these AgIVC enablers and inhibitors to form the basis of our empirical work. Romm and Clarke's [6] work provided a useful starting point – a high-level integrative model characterising the relationship between VCs and society. This case study therefore enabled us to develop and refine our own model, adapted from the work of Romm and Clarke [6], which encapsulates the various AgIVC inhibitors and enablers which need to be addressed

by mediators and developers of these environments. We also anticipate that this AgIVC Development Model (or at least many of the factors) will also be relevant to IVCs in general.

In this paper we will:

- summarise the foundation literature which was used to identify potential enabling and inhibiting factors applicable to AgIVC development;
- outline the research design used to refine and identify additional factors not evident from the literature;
- describe the research findings leading to our AgIVC Development Model, based on the work of Romm and Clarke [6]; and
- outline future research opportunities from our work.

II. AN INITIAL AGIVC DEVELOPMENT MODEL

The three building blocks of Romm and Clarke's [6] model (see Fig. 1) are:

- factors which affect individuals' decisions to join a VC;
- factors which explain how members of a VC affect their immediate environment; and
- factors which describe how VCs are transforming society.

The latter group of factors (which describe how VCs transform society) were not relevant to our model of AgIVC development because they concern how VCs affect society

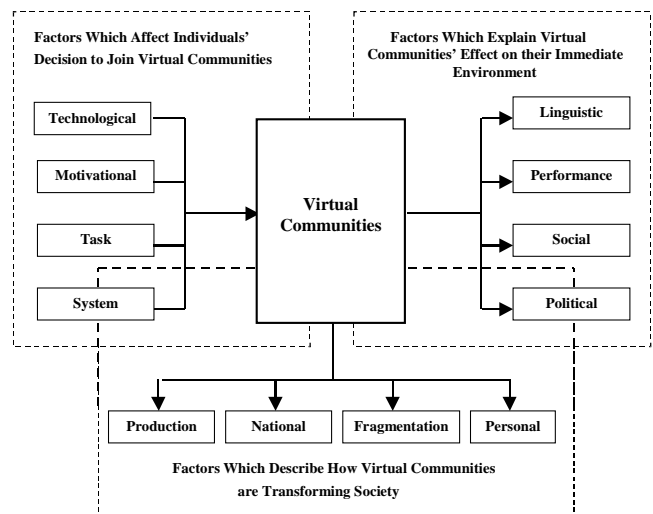


Fig. 1. Virtual Communities and Society Model (Romm and Clarke 1995)

through changing production systems, national identities, community integration/fragmentation, and personal relationships. Our research, however, focused on AgIVCs with an agricultural business, rather than societal, focus, so that these factors were not studied. We anticipate that as our research expands to include other forms of AgIVCs with a more society-transforming dimension, these factors will be incorporated.

The remaining two groups of factors, however, appeared to have greater bearing on the likely development of AgIVCs, because they concern factors influencing a potential member's decision to join a VC and factors which affect the way in which existing VC members interact with each other. We therefore examined the literature on rural IT inhibitors and enablers (since Australian AgIVCs are primarily rural or regionally based), in addition to VC literature, to identify specific factors affecting the development of AgIVCs.

A. *Technological Factors*

Possible technological factors which might reduce the desirability of joining an AgIVC range from infrastructure and service issues, to Internet-specific and general computing issues. Infrastructure and service issues identified by many authors [for example, 7, 8-17] which inhibit rural use of IT are:

- extremely high costs for timed connections to the Internet;
- reduced access to telecommunications infrastructure due to the remote locations of many potential members; and
- low quality, low speed lines for Internet connections.

Factors which have been identified as important for ensuring the usefulness of the Internet [see, for example, 13, 18-22] for rural users include:

- providing relevant content (such as weather, price and marketing information) centrally, so that members can avoid the difficulties and ineffectiveness of Web searching; and
- addressing the security and privacy concerns of rural Internet users.

General computing factors which are suggested as being especially important in the context of rural IT users include ensuring that:

- technology used is consistent (and continues to grow) with the needs and capabilities of the AgIVC members [see 23];
- computer system features do not exceed (or complicate) the core function of the AgIVC [see 24]; and
- software is compatible, although it is anticipated that the multi-platform nature of the Internet and, in particular, the Web will reduce these types of problems.

B. *Motivation Factors*

Motivational issues such as user conservatism, resistance to change and lack of confidence might also be significant in the context of rural IT users [see 16]. More specifically, the

following motivational factors have been identified as important to rural IT use (which, if addressed, might lead to confidence by rural business people in joining AgIVCs):

- providing opportunities for experimentation with the technologies used in an AgIVC to increase member familiarity and confidence with these tools [see 8];
- offering education and training programmes which demonstrate the advantages offered by electronic communication [7, 8, 16, 17, 25, 26] and its relevance to farming business operation;
- ensuring sustainable funding for AgIVC infrastructure and support [see 8], which might include securing government funds to cover start up costs [see 24]. If the AgIVC is deemed to be unsupported, confidence in its success by members will be low;
- ensuring strong leadership and sponsorship to champion the AgIVC [see 8, 27] and to affect change [see 28]. This is needed so that member enthusiasm can be generated and maintained and so that the distinctive focus of or vision for the AgIVC can be achieved; and
- providing technical support for AgIVC members, such as telephone support and consulting services [see 25]. This might be especially important if rural business people are computer illiterate.

Motivation factors also relate to the perception of benefits which the potential member believes they might gain from membership [after 28], which would involve:

- ensuring that the needs of members are the primary focus [see 27] so that the AgIVC remains relevant and useful. This implies the need for feedback mechanisms;
- providing access to the services which are being withdrawn from regional areas, such as government and banking services [9, 29];
- reaching a critical mass of membership, since for many individuals the value in joining the AgIVC might be dependent on the number of existing members [4, 24, 28];
- providing evidence of the likely costs versus benefits from membership of the AgIVC [8]. This implies the need for [see also 27, 28]:
 - regular monitoring of the AgIVC to ensure it is running smoothly
 - keeping the AgIVC stakeholders informed of this progress
 - establishing measures of success on which to base anticipated benefits
 - analysing the AgIVC's alignment with its members' business goals and strategies
- providing relevant content and considering content filtering so that the AgIVC continues to offer the information and resources needed by its members [5].

C. *Task Factors*

Task factors relate to the AgIVC members' perception of whether Internet-based applications are able to support the

“richness” of their communication and the “meaning” this would convey [see 1]. The usefulness of an AgIVC to a member might therefore be dependent on:

- offering alternative Internet-based communication which support various “richness” levels;
- providing experimentation and education opportunities to show computer illiterate rural members how this media can still be used to provide “richness” despite the lack of face-to-face or direct verbal communication.

D. System Factors

System factors relate to the fit (or compatibility) between the AgIVC and the member’s environment [1] or their “traditional” ways of doing things. Compatibilities which might be significant in an agricultural context include:

- the current competition among agricultural businesses and whether the AgIVC disrupts this balance, especially if it changes the nature of national and global competition;
- the current interrelationships between agricultural businesses and whether the AgIVC changes this structure;
- the current “power” of some regional agricultural players and whether the expansion (through the AgIVC) to include national and international players will upset this power;
- the current culture of agricultural communities and whether the AgIVC can facilitate this culture. Cultural elements might include, for instance, the members’ desire or need for privacy, anonymity and security. Romm and Clarke [1] also state that members over time will develop a common belief about the value of the technology (and hence the AgIVC), so that it will be important to ensure that this “cultural” position is a positive one; and
- the traditional synchronous method of communication and whether an AgIVC, which is largely based on asynchronous communication, is a viable substitute [6].

E. Linguistic Factors

Linguistic factors in Romm and Clarke’s [1] model concern how members in an AgIVC might develop Internet-mediated communication conventions, such as using text-based expressions (e.g, smiley faces) to convey additional meaning [see also 2, 30]. Such conventions help to address the communication richness issues of the Task Factors. Netiquette conventions are another example. Linguistic factors also imply the importance of educating potential AgIVC members about these conventions.

F. Performance Factors

Performance factors relate to such issues as being able to promote group cohesion and unity [1] within the AgIVC, and to ensure that members can function effectively within the AgIVC. This might be achieved by:

- encouraging member-generated content [see 31], so that members develop a feeling of ownership of the AgIVC. This might include the sharing of experiences or knowledge which might be deemed useful to other

members, so that the promotion of a knowledge-sharing culture in an AgIVC becomes critical [see 27]; and

- establishing formal roles, such subject matter experts, knowledge managers, mediators or facilitators etc to address member relations issues and to ensure AgIVC resources are relevant and useful to the membership [27].

G. Social Factors

Social factors relate to the effect that electronic communications might have on social behaviour within a group [1]. Social factors which might need to be considered in the context of AgIVCs are:

- encouraging the formation of informal roles, such as community advocates, leaders and instigators [27] to encourage others (such as shy or reserved members) to participate in the AgIVC;
- encouraging self-policing to deal with those who engage in anti-social [23, 32] such as flaming; and
- establishing a conflict management programme for mediation and the handling of disputes if required [33, 34], since VCs typically allow free speech and the free flow of information [32].

H. Political Factors

Political factors refer to the use of the AgIVC for political purposes [1]. This might include using the AgIVC as a forum to raise, discuss and arrive at a consensus concerning political issues at national and global levels which affect members. The appropriateness of encouraging or disallowing this use of the AgIVC might depend on the:

- tensions and divisions such discussions might cause; and
- ability of members through this forum to effect changes to government policy.

I. Legal Factors

Legal factors are not addressed explicitly in Romm and Clarke’s [1] model, although some authors [see, for example, 32] believe that the current legal uncertainty in the Internet environment might impede the success of IVCs. These issues might include libel, slander, copyright and trade law, and also the issue of who has responsibility for infringements in these areas. For this reason, we have included legal factors in our AgIVC Development Model, since these unresolved issues might reduce the attractiveness of joining an AgIVC.

J. Network Analysis Factors

Social network analysis, as applied to computer-based social networks, attempts to detect structural patterns in these networks, examine the implications which structural patterns have on the behaviour of network members, and study the impact of characteristics on network members and their social relationships [35]. These factors are different to the Social Factors identified by Romm and Clarke [1], because the Social Factors attempt to describe the social behaviour of the AgIVC and the interplay between the VC and the

environment. Network Analysis Factors, however, examine and measure the strength of member relationships and structure within the VC. This dimension, based on the work of Wellman [35], gives rise to the following factors:

- discouraging control being exercised by external sources on AgIVC members' interaction [6], because this might impede their freedom of communication;
- determining different means of Internet-based communication which will be appropriate to the size and diversity of the AgIVC membership [see 6]. This might be necessary because some tools (such as chat groups) are not suitable for large memberships;
- encouraging members to be active participants in the AgIVC and to interact frequently with AgIVC staff and other AgIVC members on matters of interest; and
- providing multiple means for members to control their access to other members, such as email and chat rooms.

III. RESEARCH DESIGN

K. Research Method

The case study method was employed to confirm and to identify new factors from those in the literature, because of this approach's potential to support exploratory investigations such as ours [36, 37]. This method also enabled us to understand more clearly *why* factors were significant and *how* they enabled or impeded AgIVC development [see 38].

We identified six Australian AgIVCs which satisfied the majority of the IVC criteria (see the Introduction) using the Internet and local contacts. Of these six, the mediators of two AgIVCs (labeled A and B) agreed to take part in the study and to send interview invitations to their members to take part also. Despite six AgIVC A members agreeing, no AgIVC B members responded. The lack of members responding from AgIVC B meant that multiple case studies were not possible. We did, however, use the interview data from the AgIVC B mediators to increase confidence in our findings. Interviews with both mediators and members was intended to enable us to identify enabling or impeding factors associated with AgIVCs from a variety of perspectives.

L. AgIVC Descriptions

AgIVC A was established by an Australian organisation as a pilot project to help farm businesses in regional areas, running from June 1996 until late 1998. While the project has ended, many of the original 1000 participants are still members, which suggests AgIVC A has been successful and that much can be learned from their experiences. The project began by offering only email and a Web site, later adding chat room, newsgroup and bulletin board facilities. The AgIVC provides a range of agriculture information (such as market, commodity prices, and weather details), member advertisements, banking and R&D information, newsletters and rural/agricultural links. The current mediator of AgIVC A was interviewed. The mediator was not the original mediator, but played a relevant role during the pilot. The six

members interviewed joined the AgIVC in 1996 when the pilot project started and came from various locations across regional Australia.

AgIVC B was originally formed in 1991 and then redeveloped in 1994 – its focus being to put land carers in touch with each other to enhance the Australian land care process. The AgIVC began by offering a bulletin board based network only accessible to subscribers, but is now accessible to anyone through the Web. AgIVC B therefore has no formal membership, which might explain the lack of response from members. It provides land care information (including the activities of land carers), announcements and weather updates. The two current mediators sharing this responsibility participated in this research.

IV. REFINEMENT OF THE AGIVC DEVELOPMENT MODEL

The interview data was analysed to determine which of the enabling and impeding factors from the literature were raised by the respondents. Any new factors raised by the mediators or members were also included. System and Network Analysis Factors were not studied because they will require a more longitudinal investigation. The following sections summarise the results:

M. Technology Factors

Table 1 shows the technological-based impediments identified by mediators (column A and B refer to AgIVC A and B mediators respectively) and members (column M). The findings suggest that quality and affordable access, a gradual introduction of relevant IVC software and good quality information search facilities are needed to facilitate the development of AgIVCs. These factors correspond with those found in the literature.

TABLE 1
TECHNOLOGY FACTORS (IMPEDIMENTS)

Factor	A	B	M	Description
Reduced access	✓	✓	6	<ul style="list-style-type: none"> • some AgIVC A members never got online • 1 member had to install own fibre optics
High telecom costs	✓	✓	1	<ul style="list-style-type: none"> • rural users charged excessive hourly rates • rural users pay long-distance rates • 2nd member said costs were high, but worth it
Low telecom quality/speed	✓	✓	5	<ul style="list-style-type: none"> • 2 members experienced low connection speed
Ineffective search engines	✓	✗	2	<ul style="list-style-type: none"> • 2 members said search engines are hard to use & return mostly irrelevant results • 1 Internet experienced member disagreed
Security & privacy			1	<ul style="list-style-type: none"> • 1 member experienced credit cards fraud • a 2nd member said this was not an issue
Systems match needs & core IVC functions	✓	✓		<ul style="list-style-type: none"> • Both AgIVCs commenced with email & a simple Web presence, adding other applications over time when needed by the community
Software compatibility	✓	✗	1	<ul style="list-style-type: none"> • chat room software incompatibilities • operating system problems when accessing the AgIVC
Computer equipment	✓	✓	1	<ul style="list-style-type: none"> • members having outdated equipment • faulty power supplies in rural areas

N. Motivation Factors

Table 2 shows the motivational enablers identified by mediators and members. The findings show that participants stated that membership benefits (over the costs), relevant content/services and feedback and support mechanisms were important to AgIVC effectiveness. These factors help ensure the usefulness of the AgIVC (and its services) and ensure that members' can seek help when needed.

TABLE 2
MOTIVATION FACTORS (ENABLERS)

Factor	A	B	M	Description
Evidence of benefits over costs	✓	✓	6	<ul style="list-style-type: none"> • Benefits (over costs) experienced include: <ul style="list-style-type: none"> • accessing agricultural news & info. • using email for business communication • ordering farm machinery, etc • More AgIVC members online will increase the demand for rural info. & services
Relevant content/services	✓	✓	6	<ul style="list-style-type: none"> • All members stated content/services were relevant • AgIVC A provided its own Web content initially because most was American
Measurements of success	✓	✓	3	<ul style="list-style-type: none"> • Measured by member participation levels • Measured by questions & issues raised • AgIVC A measures using member surveys • AgIVC B measures by links on Web site to members' pages and email addresses • Members used a list of measures including: <ul style="list-style-type: none"> • Quality/efficiency of info./services • Number of AgIVC members
Feedback mechanisms	✓	✓	6	<ul style="list-style-type: none"> • Fax, phone & email feedback encouraged • Members mostly provided technical feedback • 1 member gave feedback in the form of links • AgIVC A conducted member surveys
Support infrastructure	✓	✓	2	<ul style="list-style-type: none"> • Help desks for technical problems • Members stated staff morale & technical support was very helpful

Additional motivational factors (see Table 3) were identified by the mediators concerning the running and coordination of the AgIVC. These issues included the need to filter and customise content so that it is relevant to members, to monitor constantly the AgIVC to determine any changes needed to the environment, to obtain funding and to ensure that the AgIVC exhibits strong leadership.

TABLE 3
MOTIVATION FACTORS (ENABLERS, FROM MEDIATORS)

Factor	A	B	Description
Content filtering/customising	✓	✗	<ul style="list-style-type: none"> • AgIVC A only puts services & links relevant to its members, thus filtering content • AgIVC A provides password protected areas, & AgIVC B plans to do this in the near future, to customise content
User conservatism	✓	✓	<ul style="list-style-type: none"> • Both AgIVC mediators found this a problem, which was largely overcome using education
Regular monitoring	✓	✓	<ul style="list-style-type: none"> • AgIVC A monitors services & performance using member surveys to make changes needed • AgIVC B analyses Web site logs. It also reviews & updates the site monthly
Sustainable funding	✗	✓	<ul style="list-style-type: none"> • AgIVC B has found funding a problem since sustained funding ended in 1995

Factor	A	B	Description
Strong leadership	✓	✓	<ul style="list-style-type: none"> • Leaders were identified by both AgIVCs as responsible for its development – especially their ability to work with people & adversaries • AgIVC A project manager appealed to rural people to get them online - AgIVC B's steering committee filled this role • Members were recruited using public adverts

These factors raised by both mediators and members correspond with those identified from the literature.

O. Task & Linguistic Factors

The mediators of both AgIVCs ensured that a range of alternative Internet media were provided for various types of electronic interaction between members. In addition, AgIVC A provided both online and offline training in the use of these media. There is also evidence that members believe they are able to interact effectively using these media - for instance, 2 members stated that they used text symbols to convey meaning during their electronic discussions.

These findings provide indicative support for the literature that it is important for alternative communication media (and training in these media) to be provided to counter the reduced richness of face-to-face interaction in AgIVCs. The results also suggest that, linguistically speaking, these media can still enable meaningful discussions among members, so long as appropriate training in their use is provided.

P. Performance Factors

Our research findings confer with the literature that formal roles are important for supporting effective performance of members within AgIVCs (that is, allowing them to function, discuss, etc). For example, both AgIVCs had such formal roles as facilitators/managers running the AgIVC day-to-day, staff providing members with technical support and knowledge experts advising mediators on content/services.

The responses from members of AgIVC A suggest that a knowledge sharing culture had been established to some extent to enhance the functioning of the AgIVC. For instance, three members stated that they posted their own content in the form of opinions during chat room sessions, and two of these same members posted other content in the AgIVC.

One factor not considered by the literature, but which was identified by the AgIVC A participants, was the knowledge gap between city and country people. For example, when rural members talked to city-based telecommunications providers, they were often asked for house numbers and streets - which many rural people do not have. This example suggests that people involved (either directly or indirectly) with AgIVCs need to understand the unique problems and needs of rural people so that AgIVC members can perform their activities effectively.

Q. Social Factors

Our research findings both correspond with and contradict the literature concerning social factors impacting on AgIVCs (Table 4). Member conflict was not an issue, but this might

have been because of the rules of conduct and the filtering of content enforced by both AgIVCs. For this reason, a conflict management programme was not found necessary. Informal roles were not identified by the AgIVCs, but informal helpers often provide content, assistance and support.

TABLE 4
SOCIAL FACTORS (ENABLERS)

Factor	A	B	Description
Informal roles	✗	✗	<ul style="list-style-type: none"> • No informal roles were identified, although: • AgIVC A had proactive members providing technical support & advice to other members • AgIVC B had a number of helpers & contributors informally associated with the AgIVC, as well as other members offering problem solving, advice & content
Conflict management	✗	✗	<ul style="list-style-type: none"> • Neither AgIVC had a conflict management programme, due to low or no conflict at present
Policing/ rules of conduct	✓	✓	<ul style="list-style-type: none"> • AgIVC A established a set of rules governing chat room discussions & deleted any offensive or inaccurate postings • AgIVC B receives all postings by email before they are put on the Web site after offensive content was encountered when their BBS had an open forum policy

R. Political Factors

AgIVC A invited political figures into chat room discussions involving members. These forums were monitored by staff to ensure that everyone had their say and that rules were enforced. AgIVC B mediators also raised the issue that these communities can provide forums for political discussions, which might influence government policy. There appears to be support, therefore, that such forums might be increase member interest and, therefore, be an enabler of AgIVC development.

S. Legal Factors

None of the AgIVC mediators or the members of AgIVC A experienced any legal problems, such as offensive content, copyright, etc. While these circumstances might change in the future, legal factors do not appear to be an inhibitor or enabler of AgIVC development at this stage.

V. CONCLUSIONS & FUTURE RESEARCH

Fig. 2 illustrates the AgIVC Development Model resulting from our literature survey and the case study involving one Australian AgIVC (with supporting evidence from a second). Our research uses the general VC model proposed by Romm and Clarke [1] to build a model by incorporating specific factors which appear to enable or impede the success and development of AgIVCs.

Our research findings are important, because this study has extended the currently limited empirical research in the area of IVCs and because many of our indicative findings appear to support the literature theorising on the factors which enable or inhibit the development of AgIVCs.

Our future research will involve investigating the factors identified more thoroughly (using both surveys and more

indepth, longitudinal case studies) to understand better their significance in the development of AgIVCs and IVCs generally. We anticipate that this research will lead to a comprehensive guideline for mediators and developers wanting to establish an AgIVC, or IVC in general, and to a more detailed theoretical model of (Ag)IVC development.

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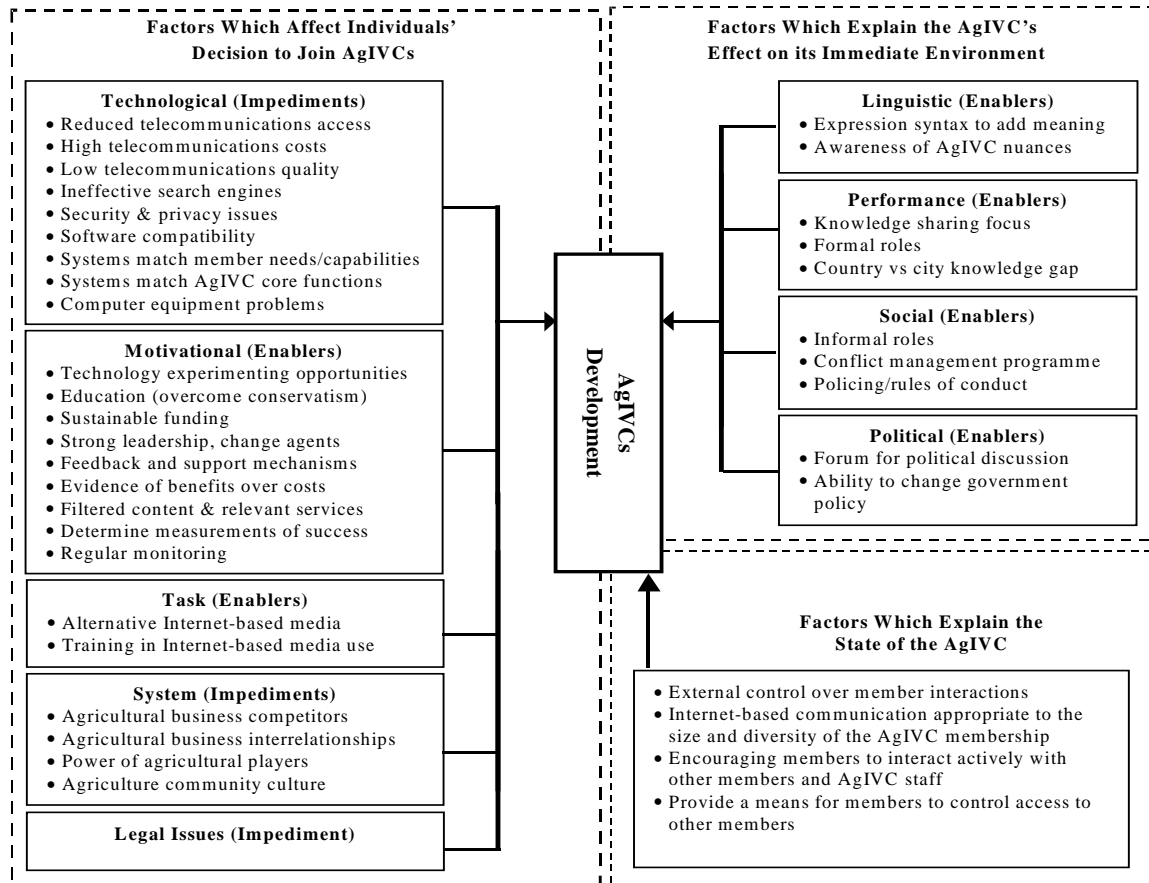


Fig. 2. An AgIVC Development Model