A survey of structured cabling in mainland China

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Abstract

Selection of the cabling media to be used is often difficult, and installation of vertical and horizontal structured cabling is costly and disruptive. Bandwidth, distance requirements, immunity to interference, security, installation disruption and future technology should all be considered when selecting appropriate transmission media. Further, organisational characteristics such as industry, network size, and budget may also influence the cabling selection.

In order to maximise ROI, organizations want to avoid replacing infrastructure after a short time-span, and thus want to ensure that future technologies will operate over the chosen media. However, this is problematic because there are currently no clear industry favourite transmission media; previous research has shown that copper, fibre, and wireless media all have their proponents who are equally adamant that their particular medium is the best choice.

Research described in this paper reports which factors influence the cable selection decision in mainland China. The findings can be used to improve cable decision selection in the future.

1 Introduction

Business increasingly demands higher bandwidth from communication networks as data volumes increase, and as new applications such as distributed and graphically intensive applications and grid computing become available. Such increases are driven by a phenomenon now known as "Moore's Law", which postulates that computers double in sophistication every 18 months (Nassoura, 2000; Moore, 1965). Further, the need to rapidly transmit increasingly large volumes of data becomes more important as workforces become increasingly mobile and dispersed. These trends drive demand for higher bandwidth connections, which in turn has implications for the physical infrastructure that makes up the corporate network.

Structured cabling is the name given to the communications media embedded within a

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building. Structured cabling is normally enclosed within cable ducts in a building's walls and ceiling space, and connects different floors by running through cable risers. Such risers are also often used to provide electrical connectivity through the building, as well as other services such as plumbing. The structured cabling backbone, also known as vertical cabling, connects wiring closets and floors of the building together (Clark, 2002). Horizontal cabling connects network devices to the backbone, and normally ends at a plate in the wall. The connection is completed by running a short cable from the network device to the wall plate (Vacca, 1999).

In terms of Nassoura's (2000) model, structured cabling fits within the fourth, and lowest, layer of the business technology architecture. The remaining three layers, from top down, are the Business Applications which facilitate business operations, the PCs and Workstations with which the applications are used, and the Communication System, which includes communication equipment such as switches and routers.

Compared with the three layers above it, the cabling infrastructure is not a major part of the cost of the business technology architecture - new installation cost is only about 5% of the total cost of the business technology architecture software (BusinessWorld, 2001; Loe, 1994). However, the cabling system plays a fundamental role because all the other layers are built upon it. A poor cabling system will cause numerous problems such as data errors caused by interference, congestion caused by inappropriate bandwidth, disconnection caused by broken or overly long cables, and possible security weaknesses due to the ability to tap into copper or wireless connections (BusinessWorld, 2001; Loe, 1994; Smith, 1992).

This dependence on the cabling infrastructure is highlighted by Inverso (2001), who points out that nearly half of all network faults are the result of poor cabling. Inverso's estimate may be conservative – Groth *et al*. (2001) put the figure at nearly 70%. Furthermore, Groth *et al*. suggest that the physical layer is the most neglected aspect of computer network design. While cabling may only comprise 5% of the IT infrastructure budget, if an organisation does not spend this money wisely they may have to pay much larger sums in on-going costs and premature replacement (Dell, 2005; Nassoura, 2000; Haupt, 1999). It follows then that organisations should ensure the infrastructure they install will sustain their information technology infrastructure for the foreseeable future (Haupt, 1999).

A clear picture of which cable types will be widespread in the future is not available at present. Twisted Pair copper cables such as Cat5e, Cat6, and Cat7, as well as fibre types such as single-mode, 50 μm multimode and 62.5 μm multimode all have their supporters in roughly equal proportion (Dell, 2005). If one also considers other media such as wireless media or coaxial cable, which while considered out-of-date is still capable of data rates of gigabit and higher[1], the situation becomes even less clear.

[1] 1000baseCX is an IEEE standard for gigabit networking that operates over short distances using 150 ohm balanced coaxial cable, also called "twinax" (Bruno, 2002). The IEEE 10GBaseCX4 standard

IT managers about to install structured cable are thus faced with the dilemma of what cable type to install, with no clear direction emerging from the industry.

2 Hypotheses

China is a developing country; the dissemination of information technology and its influence on organisations is still at an early stage when compared with developed countries. Organisations from different industries might rely on their cabling system to different degrees. In other words, without strong cabling infrastructure, some organisations in China may not survive, while others may continue unhindered. Different industries will likely have different network requirements, leading to different cabling decision-making. This leads to the first hypothesis investigated in this paper:

> *Hypothesis 1: In mainland China, the industry of the organisation affects the outcome of their cabling decisions.*

The cabling system is embedded with building structure, and is much harder than the other three layers to install, update and replace (Cook, 2000; Desrosiers, 1999). The cost of installing a new system, or updating an old cabling system (including removing the old system first and then installing new system) after the building construction will be up to four times higher than the new installation of cabling system during building construction (McElroy, 1997). Moreover, different network media and related network equipment have entirely different market prices. Fibre is a photonic transmission medium which requires higher technology to operate and install than copper. Thus, fibre installation and related network equipment is more expensive then traditional electron-based network media.

Therefore, the amount of an organisation's IT budget might have significant influence to what kind of network medium they may choose. This leads to the second hypothesis:

> *Hypothesis 2: In mainland China, the organisation's IT budget affects the outcome of their cabling decisions.*

As an organization's network grows, more computers are added into the network and the distance between computers increases; this leads to a likely increase in the traffic volume within the network. Thus, a small network might have very different requirements when compared to a larger network. Therefore, the network size of an organization might have significant influence on cabling decision-making. This leads to the third hypothesis:

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also allows for 10 Gbps transmissions over multiple pairs of twinax.

Hypothesis 3: In mainland China, the size of the organisation as a factor affects the outcome of their cabling decisions.

In the case of wired systems, cables can be either copper wire or fibre optic, and there is a range of cables available. Some have already been indicated above – Cat5e, Cat6, Cat7 in the case of copper cabling and single and multimode cables in the case of fibre. Copper cable is cheaper and easier to install, and although technological developments sometimes cloud the issue, fibre is faster than copper as distance increases.

In the case of wireless systems, signals are transmitted using radio signals, usually in the unlicensed ISM band. Wireless networks have the advantage of being more flexible and mobile than their wired counterparts (BusinessWorld, 2001). Cook (2000) observes that "changes in business operation are placing increased demands on infrastructure systems" and companies are also frequently reconfiguring their work space and furniture layout to meet changing business needs (Nassoura, 2000). The current trend of maximizing open office spaces and reducing traditional closed offices also creates pressure to introduce wireless networking in corporate environments (Nassoura, 2000). The major concerns with wireless networks are the limited bandwidth available when compared to wired systems, signal range, and potential security risks (Ciampa, 2002; AirDefense, 2003; Wexler, 2004).

The different forms of copper, fibre and wireless media have different features and capabilities such as cost-efficiency, bandwidth, distance, and ease of installation and maintenance. These characteristics might influence decision makers when choosing appropriate media for their own organisation. This leads to the fourth hypothesis:

Hypothesis 4: In mainland China, the cable characteristics and capabilities as a factor is associated with cabling decision-making.

Finally, as Nassoura (2000) pointed out, the different layers of the business technology architecture have different life cycles. Business applications have the shortest life cycle in comparison with the other three layers, typically varying from several months to one or two years. PC and workstations have a longer life cycle, which might vary from half year to three years. An organisation's communication system usually lasts anywhere in the order of three to seven years, while the cable infrastructure has longest lift cycle and can survive up to fifteen or twenty years (Nassoura, 2000; Phan, 2001).

Consequently, organisations should try to seek the most future proof cable infrastructure. In other words, people's beliefs about which cable types will be dominant in the future might influence the selection of cable in structured cabling systems, both vertically and horizontally. This leads to the last hypothesis assessed in this study:

Hypothesis 5: In mainland China, the technology that people believe will be dominant in the future affects their cabling decision-making today.

Future proofing is a very common idea when organisations are choosing their cables (Cook, 2000). It is widely believed that fibre is more future proof than copper, thus the simplest decision for many organisations is just running fibre optics everywhere around the building (Haupt, 1999). And some current available cabling technologies do provide a very cost-effective fibre optic solution (Allen, 2000). While this sounds like a good idea, it may not be the best one (Cook, 2000; Desrosiers, 1999). Whether it is really necessary to install fibre throughout the organisation is another thing that needs to be considered from a business efficiency point of view, rather than from a purely IT industry perspective (Haupt, 1999).

Cost efficiency and result effectiveness are always the necessary concern of any business organisation (Desrosiers, 1999). As mentioned above, the cost of using fibre is not only the cable itself but also includes the cost of fibre related hardware such as NICs, jacks, fibre switches, and routers, and is normally much more expensive than copper or wireless systems, and fibre is also more expensive to install (McElroy, 1997; Haupt, 1999). Further, Cat5e can supply almost the same data carrying capability as fibre in horizontal cabling, and is much cheaper (Cook, 2000; Haupt, 1999).

The discussion above describes the issue being explored by the current research. A number of factors are likely to influence which communications media are selected by IT managers when implementing structured cabling. The objective of this research is to discover the factors that influence the cabling decision making of IT managers in mainland China, and to further facilitate the development of a framework to model cable adoption in the future. This will help to minimize the risk involved in cable selection, thus resulting in a more efficient IT industry as a whole. This will be of benefit to any organisation that currently faces or will face the dilemma of selecting an appropriate physical transmission medium.

To the authors' knowledge, this study is the first such project conducted in mainland China. China is one of the biggest developing countries in the world; the development, influence, and dissemination of information technology is still at an early stage in comparison with developed countries. Little IT field research has been undertaken, and no previous studies relating to structured cabling have been conducted. It is necessary to conduct such research in mainland China to allow IT managers there to achieve better cable selection decision-making.

3 Research model

The hypotheses for this study propose five variables that might influence IT managers' cabling decision-making. These are illustrated in the following research model.

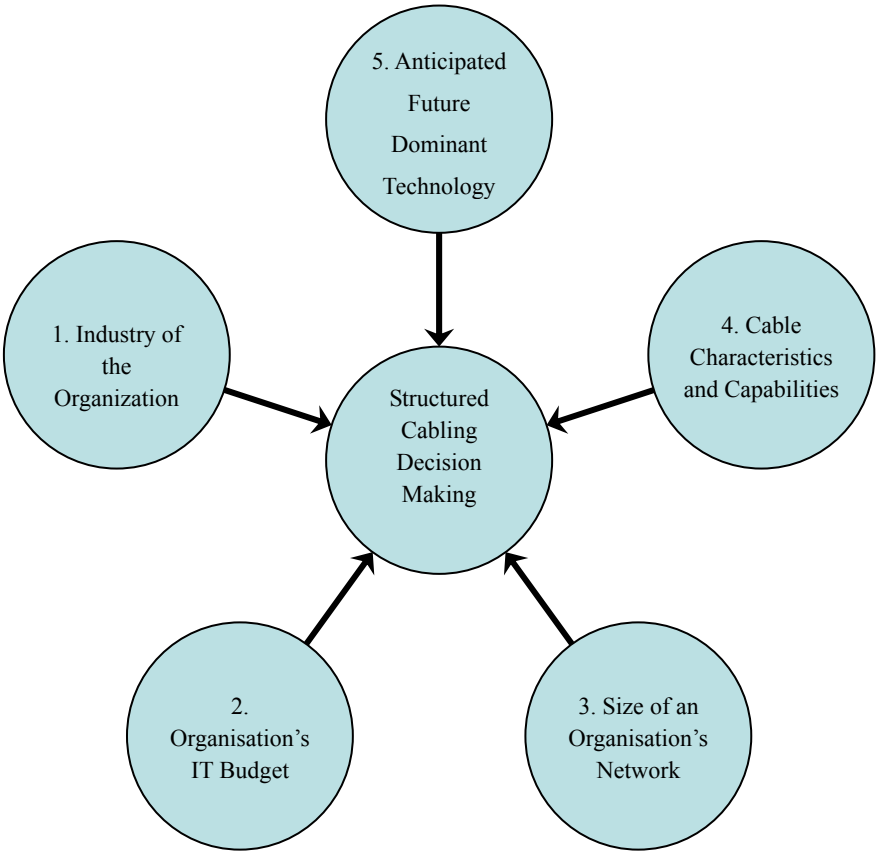

Figure 1: Research Model

4 Research Method

Due to their location in Western Australia, the researchers drew on a network of social and business contacts in mainland China to collect data. The snowball sampling technique (Zikmund, 2003) was used to generate a sample of participants in mainland China for administering of a survey via email. Finally, the researchers received returned questionnaires from 252 respondents, describing 252 different organisations' cabling decision making in mainland China.

These 252 organizations are spread throughout 25 cities in mainland China. Respondent organisations' networks vary in size from less than 10 computers to more than 500 computers and were fairly evenly distributed across this range. The sample included organisations from 14 different industries, namely, finance and accounting, IT, consulting, customer service, education, engineering, business administration, manufacturing, professional service (medical or law), social/science research institution, advertising and sales, trading and government.

Because of the cross-cultural nature of the research project, language issues cannot be

ignored. Although English is the language of the wider research project within which this study is a part, it was decided to conduct the survey in China in Chinese. The existing English-language survey instrument [2] was translated into Chinese in consultation between a native Chinese speaker and a native English speaker. The Chinese translation was then translated back into English by a third person who had not been involved in the original translation, and the two English versions were checked for consistency. This technique is known as back-translation (Usunier, 1998). Chinese responses were then translated back into English language to facilitate data analysis.

5 Data Analysis

The first stage of analysis was to test the hypotheses were tested using lambda (λ) tests, to determine if any statistically significant associations exist between the variables described in the hypotheses. All λ values have a range between 0 and 1 and reveal the strength of the associative relationship between two nominal variables such as those returned by the instrument used in this study; a higher value indicates a stronger relationship. The p value indicates the statistical significance of the relationship (Coakes and Steed, 2003); in this study $\alpha = 0.05$ was used to discard non-significant results.

5.1 In mainland China, the industry of the organisation affects the outcome of their cabling decisions.

To test this hypothesis, the industry of an organisation and the network media used both vertically and horizontally were tested to determine if a statistically significant correlation between the relevant variables could be found.

This hypothesis does not appear to be supported. When testing to determine an association between *the industry of an organisation* (independent) and *the network media used vertically* (dependent), $\lambda = 0.051$, $p = 0.284$. Thus, the industry does not appear to have any correlation with vertical media.

When testing to determine an association between *the industry of an organisation* (independent) and *the network media used horizontally* (dependent), λ could not be calculated because the asymptotic standard error was 0. A similar test, the Goodman-Kruskal tau could not be conducted because the variables contain nominal data. This leaves simply analysing the cross-tabulation (Table 1) to determine if any relationship appears to exist, however no intuitive pattern was evident in the data. This asymptotic error condition is due to the fact that the very lage majority of Chinese organizations use fibre vertically and copper horizontally, no matter what industry an organization belongs to.

[2] The English version of the survey is included in the Appendix. The Chinese translation is available from the authors on request.

Industry	Network media used horizontally						
	Copper	Fibre	Wireless	Copper & Fibre	Copper & Wireless	Fibre & Wireless	Copper & Fibre & Wireless
Accounting, Finance, Banking	11	1	1	0	0	1	0
Computer Related Industry	57	3	3	0	13	1	1
Consultant Industry	1	1	0	0	1	0	0
Customer Service	11	1	0	0	1	0	0
Education	26	5	0	1	1	0	1
Engineering	18	2	2	1	1	0	0
Business Administration	3	0	1	0	0	0	0
Government	17	1	0	0	1	0	0
Manufacturing	12	4	0	1	2	0	0
Professional Services (Medical or Law)	7	2	1	0	0	0	0
Social or Scientific Research Institute	4	1	0	0	0	0	0
Advertising and Sales	8	2	0	0	1	0	0
Trading	1	1	1	0	0	0	0
Others	8	0	2	0	1	1	1
Total	184	24	11	3	22	3	3

Table 1: Respondent industry and horizontal media

Thus, we conclude that there is no significant relationship between an organisation's industry and cabling decision-making. In other words, based on the industry an organisation is in, no any cable selection decision-making prediction can be generated.

5.2 In mainland China, the organisation's IT budget affects the outcome of their cabling decisions.

To test this hypothesis, the organisation's average IT budget and the network media used both vertically and horizontally were tested to determine if a statistically significant correlation between the relevant variables could be found.

When testing to determine if an association exists between the *organisation's IT budget* and *the network media used vertically*, λ again could not be determined because the asymptotic standard error was 0. As with the first hypothesis, the high levels of vertical fibre use in China will prevent a λ test from detecting a relationship, even if

one exists. It does appear that organisations with higher IT budgets are more likely to use fibre in the backbone, as can be seen in Table 2. Those organisations with annual IT budgets greater than ¥1 million appear more likely to use fibre than those with budgets of lower amounts. However, this conclusion can only be taken tentatively.

	Network media used in backbone						
Budget	Copper	Fibre	Wireless	Copper & Fibre	Copper & Wireless	Fibre & Wireless	Copper & Fibre & Wireless
¥0 to ¥50,000	13	20	0	0	1	0	0
¥50,001 to ¥100,000	13	14	2	0	0	0	0
¥100,001 to ¥200,000	11	25	0	0	0	2	0
¥200,000 to ¥500,000	12	37	1	1	0	1	0
¥500,001 to ¥1 Mil	10	28	2	0	1	1	0
¥1 Mil to ¥5 Mil	2	28	0	0	0	0	0
More than ¥5 Mil	3	20	0	1	0	0	1
Total	64	172	5	2	2	4	1

Table 2: IT budget and backbone media

	Network media used horizontally						
Budget	Copper	Fibre	Wireless	Copper & Fibre	Copper & Wireless	Fibre & Wireless	Copper & Fibre & Wireless
0 to 50,000	29	2	1	0	2	0	0
50,001 to 100,000	24	1	2	0	2	0	0
100,001 to 200,000	30	3	3	0	1	0	1
200,000 to 500,000	35	9	3	1	3	0	0
500,001 to 1 Million	30	4	0	0	9	0	0
1 Million to 5 Million	24	2	1	1	1	1	0
More than 5 Million	12	3	1	1	4	2	2
Total	184	24	11	3	22	3	3

Table 3: IT budget and horizontal media

Likewise, testing the *organisation's IT budget* and the *network media used horizontally* also produced an asymptotic standard error of 0. The high levels of horizontal copper use obscure any relationship if one exists. However, the cross-tabulation (Table 3) does not indicate any particular trend. Copper is clearly the most used medium in all cases. Also interesting is the low use of wireless networking, regardless of budget.

5.3 In mainland China, the size of the organisation as a factor affects the outcome of their cabling decisions.

To test this hypothesis, the size of an organisation's network (measured by the number of voice and data points within the organisation's network) and the network media used both vertically and horizontally were tested to determine if a statistically significant correlation between the relevant variables could be found.

Again, this hypothesis does not appear to be supported by the results of either test. When testing to determine an association between *the size of an organisation's network* (independent) and *the network media used vertically* (dependent), $\lambda = 0.079$, $p = 0.238$. This indicates that the size of an organisation's network in mainland China has no significant affect on the vertical medium in use.

When testing to determine an association between *the size of an organisation's network* (independent) and *the network media used horizontally* (dependent), λ could not be determined because the asymptotic standard error was 0. As with the previous tests above, the large levels of copper in use prevents any association being discovered if one exists at all. It appears from analysis of the cross-tabulation (Table 4) that copper is the preferred medium, regardless of the size of the organisation's network.

	Network media used horizontally						
Points	Copper	Fibre	Wireless	Copper & Fibre	Copper & Wireless	Fibre & Wireless	Copper & Fibre & Wireless
1 to 10 points	21	3	1	0	1	0	0
11 to 50 points	42	6	7	0	4	0	0
51 to 100 points	37	1	0	0	3	0	0
101 to 200 points	31	4	2	0	6	1	1
201 to 500 points	20	2	1	2	3	1	0
More than 500 points	31	8	0	1	5	1	2
Total	182	24	11	3	22	3	3

Table 4: Network size and horizontal media

Thus, it appears that there is no significant relationship between the size of the organization's network and cable selection decision-making.

5.4 In mainland China, the cable characteristics and capabilities as a factor is associated with cabling decision-making.

Unlike the other hypotheses, this hypothesis appears to be supported – Chinese organisations do consider characteristics of the media in their decision-making about which cable to install. The most commonly cited reasons for vertical cable were bandwidth and distance, which together were considered by 72.0% of the total respondents. Cost was only considered by 12.3% of the respondents when selecting vertical media. Future proofing was cited by 9.9% of respondents. Other cable characteristics such as legacy, electric isolation and security are only pointed out by 5.7% of the respondents.

The most commonly cited reason for vertical cable was the cost, which was considered by 50.9% of the total respondents. Bandwidth and distance were also pointed out by 29.3% of the total respondents. Legacy was only cited by 3.9% of the respondents. Perhaps surprisingly, future proofing was not considered by any respondents at all.

For wireless networking, most Chinese organisations (84.5%) are not using wireless networks, and about 60.3% Chinese organisations have no intention of installing wireless networks in the foreseeable future, while about 24.2% of Chinese organisations do plan on their installation – thus the growth rate of wireless networking in China is likely to be rapid. The major reasons for not using wireless networking are poor cost performance (21.9% of respondents), and that it is unnecessary (20.8%). To some extent, that it is unnecessary may correlate to cost concerns. The major reasons cited by organisations that intend to use wireless are flexibility and mobility.

	Vertical Cable System		Horizontal Cable System		Horizontal Wireless System
	Copper	Fibre	Copper	Fibre	Wireless
Cost	12.3%	-	50.9%	-	42.7%
	12.3%		50.9%		-
Bandwidth and Distance	9.3%	62.7%	21.5%	7.8%	-
	72.0%		29.3%		-
Legacy	1.0%	-	3.9%	-	-
	1.0%		3.9%		-
Future Proof	-	9.9%	-	-	-
	9.9		0.0%		-
Cost Performance	-		-		21.9%
Other	4.7%		16.0%		11.5%

Table 5: Key factors of concerned to Chinese organizations in cable selection

In all, vertically, bandwidth and distance capabilities of the cable are the most important factors associated with the cable selection decision-making of Chinese organisations. Horizontally, cost is the major factor influencing the cable selection process. Bandwidth and distance capabilities are the next most important factors. Legacy issues, future proofing and other “text book” cable characteristics and

capability such as electric isolation, security, stability, resistance to interference are not considered by Chinese organisations in cable selection decision-making.

As illustrated in Table 5, 50.9% all of the respondents who use copper horizontally (50.9%) and all of the respondents who use wireless networking horizontally (42.7%) cited cost as a major concern influencing this decision. 72.0% of respondents indicated that the inter-related factors of bandwidth and distance influenced their backbone media decision. Other factors do not attract anywhere near the degree of concern from respondents as cost, bandwidth and distance.

5.5 In mainland China, the technology that people believe will be dominant in the future affects their cabling decision-making today

To test this hypothesis, respondents' perception of the technology that will be dominant five years into the future, and the network media used both vertically and horizontally were tested to determine if a statistically significant correlation between the relevant variables could be found.

As with hypotheses 1, 2 and 3, when testing to determine an association between future-dominant technology and the network media used vertically, λ could not be determined because the asymptotic standard error was 0, regardless of which was the dependent variable. Again, this occurs because fibre is easily the most common backbone medium, and copper is easily the most common horizontal medium.

	Network Media used in backbone						
Main backbone in 5 years	Copper	Fibre	Wireless	Copper & Fibre	Copper & Wireless	Fibre & Wireless	Copper & Fibre & Wireless
Fibre	44	138	3	0	2	4	1
Copper	7	20	2	0	0	0	0
Wireless	9	10	0	0	0	0	0
Total	60	168	5	0	2	4	1

Table 6: Backbone media today and in five years

In the case of the backbone, there is no clear trend visible in the cross-tabulation (Table 6). It does not appear that the hypothesis that people's beliefs about the future affect their cabling decisions today is supported, at least as far as backbone media are concerned.

Main horizontal cable in 5	Network media used horizontally

years	Copper	Fibre	Wireless	Copper & Fibre	Copper & Wireless	Fibre & Wireless	Copper & Fibre & Wireless
Fibre	48	10	3	0	2	1	0
Copper	74	7	2	2	14	0	2
Wireless	56	5	6	1	6	2	1
Total	178	22	11	3	22	3	3

Table 7: Horizontal media today and in five years

Similarly, in the case of horizontal cabling, copper is the most common horizontal medium regardless of what respondents' anticipate will be dominant in five years. There does not appear to be any particular trend evident in the data (Table 7). Thus, as with vertical infrastructure, it does not appear that the hypothesis, that people's beliefs about what will be commonplace in the future affects their decisions about what cable to adopt today, is supported.

6 Other research findings

Apart from the hypothesis testing conducted in the section above, this research has also revealed some other interesting trends and characteristics in mainland Chinese cable adoption practices. These are described below.

6.1 Mixed network media in mainland Chinese organisations

In mainland China a minority of respondents (3.6% vertically and 12.3% horizontally) are using a mixed network media. This result is not surprising because Chinese organisations have relatively new cabling infrastructure; the low levels of legacy issues being reported further supports this supposition. A network composed of mixed network media is often generated in the situation of partial network update rather than an entirely new construction. Most Chinese organisations have had their cabling infrastructure a relatively short time, and so are less likely to have mixed network media installed.

6.2 Chinese organizations intend to use fibre vertically rather than horizontally

23.0% of total respondents in mainland China do not intend to use vertical fibre, and 84.5% respondents in mainland China do not intend to use horizontal fibre. That cost is the most important horizontal cable characteristic and that bandwidth and distance are the most important criteria for vertical cable explain this finding.

6.3 Chinese organizations are using relative new type of fibre.

50µm fibre is newer than 62.5µm fibre. 29.4% of total respondents are using 50µm fibre against 17.9% who are using the older 62.5µm fibre. This is additional evidence that Chinese organisations have relatively new installed network media. Legacy issues are not an important concern in mainland China.

6.4 Beliefs about obsolescence

In mainland China, over 70% respondents believe that copper will become obsolete, and the majority of Chinese respondents (77.0%) thought fibre will be the dominant backbone medium. This is not surprising, given the high levels of backbone fibre usage already in place, and the high proportion of organizations with intentions to install backbone fibre. No clear trend was found in the horizontal cable system, however. Wireless networking (28.5%), copper (40.1%), and fibre (31.0%) have similar levels of support among Chinese respondents when asked to nominate which horizontal media will be dominant in five years.

7 Conclusions

It appears that the industry to which an organisation belongs, the size of their IT budget, and the size of an organisation's network, and IT personnel's beliefs about which media will be dominant in the future do not have any influence on an organisation's cable selection for their structured cabling system.

Further, the only factors that are considered in the majority of cases are cost, bandwidth supported by the medium, and the distance of which the medium is capable. Other technical factors such as security, interference and electrical isolation are largely not considered.

Chinese organisations currently do not face the problem of legacy infrastructure in the way that organisations in developed countries do. Only 1% of respondents cited this as a concern relating to their vertical infrastructure, and 3.9% cited it as a concern relating to their horizontal infrastructure. Further, very few Chinese organisations use a mixed media network, a sign that their infrastructure has been installed relatively recently and has not evolved over time. Those Chinese organisations using fibre are also likely to use the most modern fibre type, indicating that they have installed fibre only relatively recently.

This condition cannot remain permanently; as Chinese organisations adopt more and more technology, they will increasingly be faced with legacy equipment. It is important to ensure the infrastructure they choose to adopt today will deliver the maximum productive lifespan possible. The advantage organisations in mainland China have is that, in many cases, the greenfield site is a reality rather than a theoretical scenario.

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Appendix – English version of the survey questions

General Questions

1. What is the size of your annual IT budget or the average size of your annual IT budget:

- ☐ $0 to $50,000
- ☐ $50,001 to $100,000
- ☐ $100,001 to $200,000
- ☐ $200,001 to $500,000
- ☐ $500,001 to $1 million
- ☐ $1 million to $5 million
- ☐ More than $5 million

2. Have you already deployed a structured cabling system?

- ☐ No
- ☐ Yes

3. If no, do you plan to install a structured cabling system?

- ☐ No
- ☐ Yes – within 6 months
- ☐ Yes – within 12 months
- ☐ Yes – In more than 12 months

4. What is the number of data and voice points installed in your premises?

- ☐ 1 to 10 points
- ☐ 11 to 50 points
- ☐ 51 to 100 points
- ☐ 101 to 200 points
- ☐ 201 to 500 points
- ☐ More than 500 points

Backbone / Vertical cabling

5. Which network media do you use in your network backbone? Please tick all that apply:

- ☐ Copper
- ☐ Fibre
- ☐ Wireless

6. Do you intend to implement vertical fibre cabling?

- ☐ No
- ☐ Yes – within 6 months
- ☐ Yes – within 12 months
- ☐ Yes – In more than 12 months
- ☐ We have already implemented vertical fibre

7. If you already have vertical fibre or plan on implementing vertical fibre, what type of fibre will you most likely implement:

☐ Single mode
☐ 50 micron multimode
☐ 62.5 micron multimode

8. If you use copper in your network backbone, what is the main reason?

9. If you use fibre in your network backbone, what is the main reason?

Horizontal cabling

10. Which network media do you use in your horizontal cabling? Please tick all that apply:

☐ Copper
☐ Fibre
☐ Wireless

11. Do you intend to implement horizontal fibre cabling?

☐ No
☐ Yes – within 6 months
☐ Yes – within 12 months
☐ Yes – In more than 12 months
☐ We have already implemented horizontal fibre

12. Why / why not?

13. Do you intend to implement horizontal wireless networking?

☐ No
☐ Yes – within 6 months
☐ Yes – within 12 months
☐ Yes – In more than 12 months
☐ We have already implemented horizontal wireless

14. Why / why not?

Future

15. Do you think copper cabling for structured cabling will become obsolete in the future?

☐ No
☐ Yes

16. If so, when?

17. What do you think will be the main backbone cabling medium in five years time?

☐ Single mode fibre
☐ 50 micron multimode fibre
☐ 62.5 micron multimode fibre
☐ Cat 5e
☐ Cat 6
☐ Cat 7
☐ Wireless
☐ Other

18. What do you think will be the main horizontal cabling medium in five years time?

☐ Single mode fibre
☐ 50 micron multimode fibre
☐ 62.5 micron multimode fibre
☐ Cat 5e
☐ Cat 6
☐ Cat 7
☐ Wireless
☐ Other

Other comments

If you have any other comments, please write them here.