

# Assessing the Perceived Effectiveness of Hospital Information Systems in Ghana: Agreement Between Two Information System Success Models Using Bland–Altman Analysis

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## Appendix

Supplementary **Table 9.** Description of items regarding the expanded Information System Success Model (EISSM)

| Dimensions     | Item                                                                  | Missing data rate | Number of observations (N) | Response categories |        |       |        |        | Alpha - item | Loevinger Hj Coeff | Number of NS Hjk |   |
|----------------|-----------------------------------------------------------------------|-------------------|----------------------------|---------------------|--------|-------|--------|--------|--------------|--------------------|------------------|---|
|                |                                                                       |                   |                            | 1                   | 2      | 3     | 4      | 5      |              |                    |                  |   |
| System Quality | The EMR system is friendly to me                                      | E-ISSM_SQ1        | 0.00%                      | 1416                | 2.40%  | 3.04% | 14.34% | 19.49% | 60.73%       | 0.89               | 0.41             | 0 |
|                | The EMR system is easy to use                                         | E-ISSM_SQ2        | 0.00%                      | 1416                | 2.05%  | 4.24% | 22.32% | 22.95% | 48.45%       | 0.89               | 0.39             | 0 |
|                | I believe that it is easy to get the EMR system to do what I want     | E-ISSM_SQ3        | 0.00%                      | 1416                | 1.48%  | 3.04% | 18.57% | 23.02% | 53.88%       | 0.89               | 0.34             | 0 |
|                | My interaction with the EMR system is clear and understandable        | E-ISSM_SQ4        | 0.00%                      | 1416                | 4.31%  | 4.38% | 28.25% | 25.28% | 37.78%       | 0.89               | 0.36             | 0 |
|                | Learning to operate the EMR system is easy for me                     | E-ISSM_SQ5        | 0.00%                      | 1416                | 3.60%  | 4.03% | 20.20% | 23.94% | 48.23%       | 0.89               | 0.37             | 0 |
|                | The operational speed of the EMR system is satisfactory               | E-ISSM_SQ6        | 0.00%                      | 1416                | 2.61%  | 4.52% | 26.41% | 25.49% | 40.96%       | 0.89               | 0.41             | 0 |
|                | The EMR system operates at a satisfactory pace                        | E-ISSM_SQ7        | 0.00%                      | 1416                | 5.30%  | 6.36% | 31.50% | 22.74% | 34.11%       | 0.89               | 0.38             | 0 |
|                | The EMR system runs very quickly                                      | E-ISSM_SQ8        | 0.00%                      | 1416                | 8.62%  | 9.60% | 32.13% | 21.96% | 27.68%       | 0.89               | 0.33             | 0 |
|                | The speed of the EMR system is satisfactory                           | E-ISSM_SQ9        | 0.00%                      | 1416                | 14.83% | 7.84% | 26.98% | 21.47% | 28.88%       | 0.89               | 0.32             | 0 |
|                | I believe that the screen layouts of the EMR system are well designed | E-ISSM_SQ10       | 0.00%                      | 1416                | 5.01%  | 5.01% | 24.29% | 24.93% | 40.75%       | 0.89               | 0.35             | 0 |
|                | I believe that the screen colours of the EMR system are pleasant      | E-ISSM_SQ11       | 0.00%                      | 1416                | 2.54%  | 2.82% | 18.79% | 27.26% | 48.59%       | 0.89               | 0.41             | 0 |

| Dimensions          | Item                                                                                                          | Missing data rate | Number of observations (N) | Response categories |       |        |        |        | Alpha - item | Loevinger Hj Coeff | Number of NS Hj k |   |
|---------------------|---------------------------------------------------------------------------------------------------------------|-------------------|----------------------------|---------------------|-------|--------|--------|--------|--------------|--------------------|-------------------|---|
|                     |                                                                                                               |                   |                            | 1                   | 2     | 3      | 4      | 5      |              |                    |                   |   |
| Information Quality | I believe that the volume of output per screen is suitable                                                    | E-ISSM_SQ12       | 0.00%                      | 1416                | 2.12% | 5.01%  | 18.29% | 25.56% | 49.01%       | 0.89               | 0.38              | 0 |
|                     | I generally believe that the screen interface is easy to customize                                            | E-ISSM_SQ13       | 0.00%                      | 1416                | 2.90% | 5.30%  | 21.26% | 28.88% | 41.67%       | 0.89               | 0.36              | 0 |
|                     | The function of the EMR system to correct a mistake is simple                                                 | E-ISSM_SQ14       | 0.00%                      | 1416                | 3.18% | 4.73%  | 19.14% | 26.41% | 46.54%       | 0.89               | 0.39              | 0 |
|                     | The EMR system has the ability to correct an incorrect information in a fast way                              | E-ISSM_SQ15       | 0.00%                      | 1416                | 2.05% | 2.40%  | 18.43% | 25.71% | 51.41%       | 0.89               | 0.35              | 0 |
|                     | The methods and policies governing correction and rerun of EMR system outputs that are incorrect are complete | E-ISSM_SQ16       | 0.00%                      | 1416                | 3.32% | 3.60%  | 24.72% | 28.18% | 40.18%       | 0.89               | 0.34              | 0 |
|                     | I believe that the EMR system provides the precise information I need                                         | E-ISSM_IQ1        | 0.00%                      | 1416                | 3.39% | 4.03%  | 22.60% | 21.47% | 48.52%       | 0.87               | 0.29              | 1 |
|                     | I believe that the information content meets my needs                                                         | E-ISSM_IQ2        | 0.00%                      | 1416                | 8.33% | 7.06%  | 23.52% | 20.41% | 40.68%       | 0.87               | 0.27              | 1 |
|                     | I believe that the EMR system provides reports that seems to be just about exactly to what I need             | E-ISSM_IQ3        | 0.00%                      | 1416                | 9.96% | 11.51% | 25.35% | 20.06% | 33.12%       | 0.87               | 0.33              | 1 |
|                     | The information provided by the EMR system fit my needs                                                       | E-ISSM_IQ4        | 0.00%                      | 1416                | 4.52% | 4.80%  | 23.38% | 21.12% | 46.19%       | 0.87               | 0.3               | 1 |
|                     | The EMR system provides me the right amount of information for my needs                                       | E-ISSM_IQ5        | 0.00%                      | 1416                | 5.37% | 4.87%  | 12.99% | 16.03% | 60.73%       | 0.87               | 0.26              | 1 |
|                     | I believe that the EMR system is accurate                                                                     | E-ISSM_IQ6        | 0.00%                      | 1416                | 7.34% | 4.59%  | 14.27% | 21.12% | 52.68%       | 0.87               | 0.22              | 1 |
|                     | The accuracy of the EMR system is satisfactory                                                                | E-ISSM_IQ7        | 0.00%                      | 1416                | 3.81% | 4.10%  | 22.32% | 22.39% | 47.39%       | 0.87               | 0.27              | 1 |
|                     | I believe that the EMR system provides accurate information                                                   | E-ISSM_IQ8        | 0.00%                      | 1416                | 4.17% | 6.29%  | 26.34% | 23.16% | 40.04%       | 0.87               | 0.29              | 1 |

| Dimensions      | Item                                                                                    | Missing data rate | Number of observations (N) | Response categories |        |        |        |        | Alpha - item | Loevinger Hj Coeff | Number of NS Hj k |    |
|-----------------|-----------------------------------------------------------------------------------------|-------------------|----------------------------|---------------------|--------|--------|--------|--------|--------------|--------------------|-------------------|----|
|                 |                                                                                         |                   |                            | 1                   | 2      | 3      | 4      | 5      |              |                    |                   |    |
| Service Quality | I believe that the EMR system provides reliable information                             | E-ISSM_IQ9        | 0.00%                      | 1416                | 4.24%  | 5.23%  | 22.95% | 23.23% | 44.35%       | 0.87               | 0.31              | 1  |
|                 | I believe that the output is presented in a useful format                               | E-ISSM_IQ10       | 0.00%                      | 1416                | 5.30%  | 3.95%  | 21.82% | 25.14% | 43.79%       | 0.87               | 0.33              | 1  |
|                 | I believe that the information provided is clear                                        | E-ISSM_IQ11       | 0.00%                      | 1416                | 4.80%  | 3.18%  | 23.66% | 23.45% | 44.92%       | 0.87               | 0.29              | 1  |
|                 | The layout of the output is satisfactory                                                | E-ISSM_IQ12       | 0.00%                      | 1416                | 2.33%  | 3.32%  | 17.58% | 26.91% | 49.86%       | 0.87               | 0.29              | 1  |
|                 | The format of the output is satisfactory                                                | E-ISSM_IQ13       | 0.00%                      | 1416                | 1.98%  | 3.67%  | 21.96% | 25.42% | 46.96%       | 0.87               | 0.31              | 1  |
|                 | I believe that the information is presented to me in a satisfactory way                 | E-ISSM_IQ14       | 0.00%                      | 1416                | 3.67%  | 3.81%  | 26.84% | 25.85% | 39.83%       | 0.87               | 0.27              | 1  |
|                 | I believe that I get the information I need in time                                     | E-ISSM_IQ15       | 0.00%                      | 1416                | 3.88%  | 2.05%  | 23.52% | 26.41% | 44.14%       | 0.87               | 0.27              | 1  |
|                 | The EMR system provides up-to-date information                                          | E-ISSM_IQ16       | 0.00%                      | 1416                | 4.52%  | 3.18%  | 23.80% | 25.14% | 43.36%       | 0.87               | 0.26              | 1  |
|                 | I believe that the EMR system provides me with the information in a timely manner       | E-ISSM_IQ17       | 0.00%                      | 1416                | 3.25%  | 4.73%  | 25.85% | 22.95% | 43.22%       | 0.87               | 0.26              | 1  |
|                 | The EMR system provides information that it is too old to be useful                     | E-ISSM_IQ18       | 0.00%                      | 1416                | 40.11% | 24.86% | 26.84% | 3.74%  | 4.45%        | 0.89               | -0.29             | 21 |
|                 | I believe that the EMR system provide some information that it is too late for my needs | E-ISSM_IQ19       | 0.00%                      | 1416                | 1.98%  | 4.52%  | 24.22% | 21.96% | 47.32%       | 0.87               | 0.24              | 1  |
|                 | The EMR system secures data against physical loss or damage                             | E-ISSM_IQ20       | 0.00%                      | 1416                | 6.21%  | 4.87%  | 22.32% | 20.76% | 45.83%       | 0.87               | 0.28              | 1  |
|                 | The EMR system secures data against unauthorized alteration                             | E-ISSM_IQ21       | 0.00%                      | 1416                | 3.74%  | 2.61%  | 22.46% | 19.92% | 51.27%       | 0.87               | 0.29              | 1  |
|                 | Generally, the safeguarding of the EMR system from unauthorized access is satisfactory  | E-ISSM_IQ22       | 0.00%                      | 1416                | 2.19%  | 2.97%  | 18.93% | 22.95% | 52.97%       | 0.87               | 0.27              | 1  |
|                 | I believe that the IT Unit provides satisfactory support to all users of the EMR system | E-ISSM_SerQ1      | 0.00%                      | 1416                | 2.82%  | 1.34%  | 15.25% | 18.93% | 61.65%       | 0.84               | 0.45              | 0  |

| Dimensions        | Item                                                                                                                   | Missing data rate | Number of observations (N) | Response categories |       |       |        |        | Alpha - item | Loevinger Hj Coeff | Number of NS Hjk |   |
|-------------------|------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------------|---------------------|-------|-------|--------|--------|--------------|--------------------|------------------|---|
|                   |                                                                                                                        |                   |                            | 1                   | 2     | 3     | 4      | 5      |              |                    |                  |   |
| System use        | I believe that staffs suggestions for future enhancements of the EMR system are responded to by IT' Unit cooperatively | E-ISSM_SerQ2      | 0.00%                      | 1416                | 2.26% | 5.93% | 13.49% | 17.66% | 60.66%       | 0.82               | 0.51             | 0 |
|                   | I believe that there is availability of IT' staff for consultation                                                     | E-ISSM_SerQ3      | 0.00%                      | 1416                | 2.47% | 6.99% | 19.77% | 20.90% | 49.86%       | 0.81               | 0.56             | 0 |
|                   | I believe that the amount of support provided by the vendor is satisfactory                                            | E-ISSM_SerQ4      | 0.00%                      | 1416                | 2.82% | 4.59% | 21.68% | 19.00% | 51.91%       | 0.81               | 0.56             | 0 |
|                   | The vendor is available for assistance with software difficulties                                                      | E-ISSM_SerQ5      | 0.00%                      | 1416                | 3.04% | 2.97% | 19.92% | 21.26% | 52.82%       | 0.82               | 0.52             | 0 |
|                   | The vendor is available for assistance with hardware difficulties                                                      | E-ISSM_SerQ6      | 0.00%                      | 1416                | 2.54% | 3.04% | 16.88% | 16.38% | 61.16%       | 0.84               | 0.46             | 0 |
|                   | EMR system enables me to complete my tasks successfully in a few easy steps                                            | E-ISSM_SU1        | 0.00%                      | 1416                | 2.47% | 2.90% | 14.97% | 14.12% | 65.54%       | 0.82               | 0.71             | 0 |
| User satisfaction | EMR system allows me to prevent misdiagnosis                                                                           | E-ISSM_SU2        | 14.97%                     | 1204                | 2.99% | 3.74% | 19.77% | 18.52% | 54.98%       | 0.75               | 0.75             | 0 |
|                   | EMR system allows me to provide the right medications to patients                                                      | E-ISSM_SU3        | 14.97%                     | 1204                | 4.07% | 4.40% | 16.94% | 14.78% | 59.80%       | 0.84               | 0.68             | 0 |
|                   | Overall, I am satisfied with EMR system                                                                                | E-ISSM_US1        | 0.00%                      | 1416                | 2.82% | 5.65% | 27.47% | 22.18% | 41.88%       | 0.75               | 0.5              | 0 |
|                   | In general, I am pleased to use the EMR system.                                                                        | E-ISSM_US2        | 0.00%                      | 1416                | 2.82% | 4.45% | 19.56% | 22.74% | 50.42%       | 0.75               | 0.51             | 0 |
|                   | I am positive to use the EMR system.                                                                                   | E-ISSM_US3        | 0.00%                      | 1416                | 4.31% | 7.13% | 21.47% | 25.42% | 41.67%       | 0.7                | 0.57             | 0 |
|                   | Overall, I am comfortable to use the EMR system                                                                        | E-ISSM_US4        | 0.00%                      | 1416                | 6.78% | 8.69% | 30.01% | 22.88% | 31.64%       | 0.76               | 0.51             | 0 |

Supplementary **Table 10.** Confirmatory factor analysis of expanded Information System Success Model (EISSM)

|                     | Dimensions                                                                                                    | Item        | Factor loading | Standard error | Intercept | Standard error | Error variance | Variance of dimension |
|---------------------|---------------------------------------------------------------------------------------------------------------|-------------|----------------|----------------|-----------|----------------|----------------|-----------------------|
| System Quality      | The EMR system is friendly to me                                                                              | E-ISSM_SQ1  | 1              | .              | 4.34      | 0.03           | 0.6            | 0.36                  |
|                     | The EMR system is easy to use                                                                                 | E-ISSM_SQ2  | 1.03           | 0.06           | 4.13      | 0.03           | 0.65           |                       |
|                     | I believe that it is easy to get the EMR system to do what I want                                             | E-ISSM_SQ3  | 0.86           | 0.05           | 4.26      | 0.03           | 0.64           |                       |
|                     | My interaction with the EMR system is clear and understandable                                                | E-ISSM_SQ4  | 1.01           | 0.06           | 3.87      | 0.03           | 0.86           |                       |
|                     | Learning to operate the EMR system is easy for me                                                             | E-ISSM_SQ5  | 1.04           | 0.06           | 4.1       | 0.03           | 0.79           |                       |
|                     | The operational speed of the EMR system is satisfactory                                                       | E-ISSM_SQ6  | 1.08           | 0.06           | 3.97      | 0.03           | 0.69           |                       |
|                     | The EMR system operates at a satisfactory pace                                                                | E-ISSM_SQ7  | 1.14           | 0.07           | 3.72      | 0.03           | 0.88           |                       |
|                     | The EMR system runs very quickly                                                                              | E-ISSM_SQ8  | 1              | 0.07           | 3.51      | 0.04           | 1.16           |                       |
|                     | The speed of the EMR system is satisfactory                                                                   | E-ISSM_SQ9  | 1.11           | 0.08           | 3.44      | 0.04           | 1.42           |                       |
|                     | I believe that the screen layouts of the EMR system are well designed                                         | E-ISSM_SQ10 | 1.03           | 0.06           | 3.94      | 0.03           | 0.92           |                       |
|                     | I believe that the screen colours of the EMR system are pleasant                                              | E-ISSM_SQ11 | 1.1            | 0.06           | 4.17      | 0.03           | 0.58           |                       |
|                     | I believe that the volume of output per screen is suitable                                                    | E-ISSM_SQ12 | 1.04           | 0.06           | 4.15      | 0.03           | 0.63           |                       |
|                     | I generally believe that the screen interface is easy to customize                                            | E-ISSM_SQ13 | 1.01           | 0.06           | 4.01      | 0.03           | 0.74           |                       |
|                     | The function of the EMR system to correct a mistake is simple                                                 | E-ISSM_SQ14 | 1.09           | 0.06           | 4.1       | 0.03           | 0.66           |                       |
|                     | The EMR system has the ability to correct an incorrect information in a fast way                              | E-ISSM_SQ15 | 0.89           | 0.05           | 4.21      | 0.03           | 0.68           |                       |
|                     | The methods and policies governing correction and rerun of EMR system outputs that are incorrect are complete | E-ISSM_SQ16 | 0.96           | 0.06           | 3.98      | 0.03           | 0.76           |                       |
| Information Quality | I believe that the EMR system provides the precise information I need                                         | E-ISSM_IQ1  | 1              | .              | 4.07      | 0.03           | 0.8            | 0.35                  |
|                     | I believe that the information content meets my needs                                                         | E-ISSM_IQ2  | 1.05           | 0.07           | 3.78      | 0.04           | 1.24           |                       |
|                     | I believe that the EMR system provides reports that seems to be just about exactly to what I need             | E-ISSM_IQ3  | 1.26           | 0.08           | 3.58      | 0.04           | 1.11           |                       |
|                     | The information provided by the EMR system fit my needs                                                       | E-ISSM_IQ4  | 1.1            | 0.07           | 4.01      | 0.03           | 0.85           |                       |
|                     | The EMR system provides me the right amount of information for my needs                                       | E-ISSM_IQ5  | 0.94           | 0.07           | 4.23      | 0.03           | 1.02           |                       |
|                     | I believe that the EMR system is accurate                                                                     | E-ISSM_IQ6  | 0.88           | 0.07           | 4.04      | 0.04           | 1.27           |                       |

|                 | Dimensions                                                                                                            | Item         | Factor loading | Standard error | Intercept | Standard error | Error variance | Variance of dimension |
|-----------------|-----------------------------------------------------------------------------------------------------------------------|--------------|----------------|----------------|-----------|----------------|----------------|-----------------------|
| Service Quality | The accuracy of the EMR system is satisfactory                                                                        | E-ISSM_IQ7   | 0.94           | 0.06           | 4.05      | 0.03           | 0.89           | 0.33                  |
|                 | I believe that the EMR system provides accurate information                                                           | E-ISSM_IQ8   | 1              | 0.07           | 3.88      | 0.03           | 0.92           |                       |
|                 | I believe that the EMR system provides reliable information                                                           | E-ISSM_IQ9   | 1.08           | 0.07           | 3.98      | 0.03           | 0.82           |                       |
|                 | I believe that the output is presented in a useful format                                                             | E-ISSM_IQ10  | 1.16           | 0.07           | 3.98      | 0.03           | 0.78           |                       |
|                 | I believe that the information provided is clear                                                                      | E-ISSM_IQ11  | 1.07           | 0.07           | 3.99      | 0.03           | 0.85           |                       |
|                 | The layout of the output is satisfactory                                                                              | E-ISSM_IQ12  | 0.96           | 0.06           | 4.18      | 0.03           | 0.68           |                       |
|                 | The format of the output is satisfactory                                                                              | E-ISSM_IQ13  | 0.99           | 0.06           | 4.1       | 0.03           | 0.66           |                       |
|                 | I believe that the information is presented to me in a satisfactory way                                               | E-ISSM_IQ14  | 0.85           | 0.06           | 3.96      | 0.03           | 0.86           |                       |
|                 | I believe that I get the information I need in time                                                                   | E-ISSM_IQ15  | 0.91           | 0.06           | 4.07      | 0.03           | 0.77           |                       |
|                 | The EMR system provides up-to-date information                                                                        | E-ISSM_IQ16  | 0.91           | 0.06           | 4         | 0.03           | 0.89           |                       |
|                 | I believe that the EMR system provides me with the information in a timely manner                                     | E-ISSM_IQ17  | 0.95           | 0.06           | 3.96      | 0.03           | 0.85           |                       |
|                 | The EMR system provides information that it is too old to be useful                                                   | E-ISSM_IQ18  | -0.75          | 0.06           | 2.08      | 0.03           | 1.02           |                       |
|                 | I believe that the EMR system provide some information that it is too late for my needs                               | E-ISSM_IQ19  | 0.86           | 0.06           | 4.08      | 0.03           | 0.82           |                       |
|                 | The EMR system secures data against physical loss or damage                                                           | E-ISSM_IQ20  | 1.08           | 0.07           | 3.97      | 0.03           | 1              |                       |
|                 | The EMR system secures data against unauthorized alteration                                                           | E-ISSM_IQ21  | 1.02           | 0.06           | 4.16      | 0.03           | 0.72           |                       |
|                 | Generally, the safeguarding of the EMR system from unauthorized access is satisfactory                                | E-ISSM_IQ22  | 0.87           | 0.06           | 4.23      | 0.03           | 0.7            |                       |
|                 | I believe that the IT Unit provides satisfactory support to all users of the EMR system                               | E-ISSM_SerQ1 | 1              | .              | 4.35      | 0.03           | 0.63           |                       |
|                 | I believe that staffs suggestions for future enhancements of the EMR system are responded to by IT Unit cooperatively | E-ISSM_SerQ2 | 1.18           | 0.06           | 4.31      | 0.03           | 0.58           |                       |
|                 | I believe that there is availability of IT staff for consultation                                                     | E-ISSM_SerQ3 | 1.48           | 0.08           | 4.11      | 0.03           | 0.44           |                       |
|                 | I believe that the amount of support provided by the vendor is satisfactory                                           | E-ISSM_SerQ4 | 1.43           | 0.07           | 4.17      | 0.03           | 0.4            |                       |
|                 | The vendor is available for assistance with software difficulties                                                     | E-ISSM_SerQ5 | 1.27           | 0.07           | 4.17      | 0.03           | 0.57           |                       |
|                 | The vendor is available for assistance with hardware difficulties                                                     | E-ISSM_SerQ6 | 1.02           | 0.06           | 4.31      | 0.03           | 0.68           |                       |

| Dimensions        |                                                                             | Item       | Factor loading | Standard error | Intercept | Standard error | Error variance | Variance of dimension |
|-------------------|-----------------------------------------------------------------------------|------------|----------------|----------------|-----------|----------------|----------------|-----------------------|
| System use        | EMR system enables me to complete my tasks successfully in a few easy steps | E-ISSM_SU1 | 1              | .              | 4.39      | 0.03           | 0.37           | 0.64                  |
|                   | EMR system allows me to prevent misdiagnosis                                | E-ISSM_SU2 | 1.21           | 0.04           | 4.19      | 0.03           | 0.2            |                       |
|                   | EMR system allows me to provide the right medications to patients           | E-ISSM_SU3 | 1.07           | 0.04           | 4.22      | 0.03           | 0.52           |                       |
| User satisfaction | Overall, I am satisfied with EMR system                                     | E-ISSM_US1 | 1              | .              | 3.96      | 0.03           | 0.68           | 0.5                   |
|                   | In general, I am pleased to use the EMR system.                             | E-ISSM_US2 | 1.04           | 0.05           | 4.14      | 0.03           | 0.59           |                       |
|                   | I am positive to use the EMR system.                                        | E-ISSM_US3 | 1.31           | 0.07           | 3.95      | 0.03           | 0.43           |                       |
|                   | Overall, I am comfortable to use the EMR system                             | E-ISSM_US4 | 1.06           | 0.06           | 3.66      | 0.03           | 0.85           |                       |

Supplementary **Table 11.** Description of items regarding the upgraded DeLone & McLean model (UDM)

|                     | Dimensions                                                                | Item     | Missing data rate | Number of observations (N) | Response categories |       |        |        |        | Alpha-item | Loevinger H <sub>j</sub> Coeff | Number of NS H <sub>jk</sub> |
|---------------------|---------------------------------------------------------------------------|----------|-------------------|----------------------------|---------------------|-------|--------|--------|--------|------------|--------------------------------|------------------------------|
|                     |                                                                           |          |                   |                            | 1                   | 2     | 3      | 4      | 5      |            |                                |                              |
| System Quality      | I find the EMR system easy to use                                         | DM_SQ1   | 0.00%             | 1416                       | 4.45%               | 4.31% | 18.36% | 15.61% | 57.27% | 0.78       | 0.48                           | 0                            |
|                     | I find it easy to get the EMR system do what I want                       | DM_SQ2   | 0.00%             | 1416                       | 7.34%               | 5.23% | 17.30% | 13.63% | 56.50% | 0.74       | 0.55                           | 0                            |
|                     | The EMR system is flexible to interact with                               | DM_SQ3   | 0.00%             | 1416                       | 3.74%               | 3.53% | 13.98% | 15.18% | 63.56% | 0.72       | 0.57                           | 0                            |
|                     | Learning to operate the EMR system was easy for me                        | DM_SQ4   | 0.00%             | 1416                       | 2.97%               | 3.25% | 15.82% | 17.37% | 60.59% | 0.77       | 0.5                            | 0                            |
| Information Quality | The information generated by the EMR system is correct                    | DM_IQ1   | 0.00%             | 1416                       | 2.19%               | 4.31% | 15.25% | 21.33% | 56.92% | 0.72       | 0.54                           | 0                            |
|                     | The information generated by the EMR system is useful for its purpose     | DM_IQ2   | 0.00%             | 1416                       | 2.40%               | 5.93% | 19.14% | 24.65% | 47.88% | 0.75       | 0.52                           | 0                            |
|                     | The EMR system generates information in a timely manner                   | DM_IQ3   | 0.00%             | 1416                       | 3.04%               | 4.03% | 17.02% | 22.18% | 53.74% | 0.75       | 0.51                           | 0                            |
|                     | I trust the information output of the EMR system                          | DM_IQ4   | 0.00%             | 1416                       | 2.54%               | 4.31% | 19.14% | 21.54% | 52.47% | 0.76       | 0.48                           | 0                            |
| Service Quality     | There is adequate technical support from the system's provider            | DM_SerQ1 | 0.00%             | 1416                       | 4.66%               | 6.36% | 22.60% | 20.48% | 45.90% | 0.76       | 0.37                           | 0                            |
|                     | The overall infrastructure in place is adequate to support the EMR system | DM_SerQ2 | 0.00%             | 1416                       | 3.46%               | 5.01% | 19.49% | 19.84% | 52.19% | 0.67       | 0.49                           | 0                            |
|                     | The EMR system can be relied on to provide information as when needed     | DM_SerQ3 | 0.00%             | 1416                       | 6.43%               | 6.29% | 21.47% | 18.71% | 47.10% | 0.67       | 0.49                           | 0                            |
|                     | The output of the EMR system is complete for work processes               | DM_SerQ4 | 0.00%             | 1416                       | 5.72%               | 8.47% | 23.94% | 18.71% | 43.15% | 0.69       | 0.47                           | 0                            |
| System Use          | Using the EMR system enables me accomplish tasks more quickly             | DM_SU1   | 0.00%             | 1416                       | 4.24%               | 5.65% | 21.61% | 21.19% | 47.32% | 0.58       | 0.35                           | 0                            |
|                     | Using the EMR system has improved my job performance                      | DM_SU2   | 0.00%             | 1416                       | 3.95%               | 4.24% | 17.66% | 17.66% | 56.50% | 0.55       | 0.38                           | 0                            |

|                        | Dimensions                                                                  | Item    | Missing data rate | Number of observations (N) | Response categories |       |        |        |        | Alpha-item | Loevinger H <sub>j</sub> Coeff | Number of NS H <sub>j</sub> k |
|------------------------|-----------------------------------------------------------------------------|---------|-------------------|----------------------------|---------------------|-------|--------|--------|--------|------------|--------------------------------|-------------------------------|
|                        |                                                                             |         |                   |                            | 1                   | 2     | 3      | 4      | 5      |            |                                |                               |
| User satisfaction      | Using the EMR system has made my job easier                                 | DM_SU3  | 0.00%             | 1416                       | 6.57%               | 5.23% | 16.17% | 17.37% | 54.66% | 0.62       | 0.32                           | 0                             |
|                        | I find the EMR system useful in my job                                      | DM_SU4  | 0.00%             | 1416                       | 4.80%               | 6.14% | 23.09% | 23.09% | 42.87% | 0.61       | 0.32                           | 0                             |
|                        | I am satisfied with the functions of the EMR system                         | DM_US1  | 0.00%             | 1416                       | 3.74%               | 6.00% | 23.09% | 16.95% | 50.21% | 0.75       | 0.55                           | 0                             |
|                        | The EMR system has eased work processes                                     | DM_US2  | 0.00%             | 1416                       | 4.10%               | 5.08% | 19.99% | 19.77% | 51.06% | 0.68       | 0.59                           | 0                             |
| Perceived net benefits | I am generally satisfied using the EMR system                               | DM_US3  | 0.00%             | 1416                       | 3.46%               | 4.17% | 18.64% | 18.36% | 55.37% | 0.71       | 0.58                           | 0                             |
|                        | The EMR system will help overcome the limitations of the paper-based system | DM_PNB1 | 0.00%             | 1416                       | 3.74%               | 4.24% | 22.67% | 22.25% | 47.10% | 0.77       | 0.45                           | 0                             |
|                        | Using the EMR system will cause an improvement in patient care delivery     | DM_PNB2 | 0.00%             | 1416                       | 4.17%               | 4.31% | 20.13% | 23.45% | 47.95% | 0.76       | 0.46                           | 0                             |
|                        | The EMR system facilitates easy access to patient's information             | DM_PNB3 | 0.00%             | 1416                       | 4.03%               | 5.72% | 22.81% | 23.31% | 44.14% | 0.75       | 0.48                           | 0                             |
|                        | The EMR system will enhance communication among workers                     | DM_PNB4 | 0.00%             | 1416                       | 4.10%               | 6.21% | 25.99% | 22.60% | 41.10% | 0.76       | 0.47                           | 0                             |
|                        | The EMR system use will cause improved decision making                      | DM_PNB5 | 0.00%             | 1416                       | 3.04%               | 4.10% | 20.97% | 23.66% | 48.23% | 0.77       | 0.45                           | 0                             |

Supplementary **Table 12.** Confirmatory factor analysis of the upgraded DeLone & McLean model (UDM)

| Dimensions             |                                                                             | Item     | Factor loading | Standard error | Intercept | Standard error | Error variance | Variance of dimension |
|------------------------|-----------------------------------------------------------------------------|----------|----------------|----------------|-----------|----------------|----------------|-----------------------|
| System Quality         | I find the EMR system easy to use                                           | DM_SQ1   | 1              | .              | 4.17      | 0.03           | 0.81           | 0.49                  |
|                        | I find it easy to get the EMR system do what I want                         | DM_SQ2   | 1.31           | 0.06           | 4.07      | 0.03           | 0.76           |                       |
|                        | The EMR system is flexible to interact with                                 | DM_SQ3   | 1.23           | 0.06           | 4.31      | 0.03           | 0.41           |                       |
| Information Quality    | Learning to operate the EMR system was easy for me                          | DM_SQ4   | 1.04           | 0.05           | 4.29      | 0.03           | 0.55           | 0.58                  |
|                        | The information generated by the EMR system is correct                      | DM_IQ1   | 1              | .              | 4.26      | 0.03           | 0.44           |                       |
|                        | The information generated by the EMR system is useful for its purpose       | DM_IQ2   | 0.98           | 0.04           | 4.1       | 0.03           | 0.56           |                       |
|                        | The EMR system generates information in a timely manner                     | DM_IQ3   | 0.96           | 0.04           | 4.2       | 0.03           | 0.57           |                       |
|                        | I trust the information output of the EMR system                            | DM_IQ4   | 0.89           | 0.04           | 4.17      | 0.03           | 0.63           |                       |
| Service Quality        | There is adequate technical support from the system's provider              | DM_SerQ1 | 1              | .              | 3.97      | 0.03           | 0.97           | 0.39                  |
|                        | The overall infrastructure in place is adequate to support the EMR system   | DM_SerQ2 | 1.24           | 0.07           | 4.12      | 0.03           | 0.62           |                       |
|                        | The EMR system can be relied on to provide information as when needed       | DM_SerQ3 | 1.44           | 0.09           | 3.94      | 0.03           | 0.72           |                       |
|                        | The output of the EMR system is complete for work processes                 | DM_SerQ4 | 1.39           | 0.08           | 3.85      | 0.03           | 0.76           |                       |
| System Use             | Using the EMR system enables me accomplish tasks more quickly               | DM_SU1   | 1              | .              | 4.02      | 0.03           | 0.77           | 0.52                  |
|                        | Using the EMR system has improved my job performance                        | DM_SU2   | 0.89           | 0.05           | 4.19      | 0.03           | 0.82           |                       |
|                        | Using the EMR system has made my job easier                                 | DM_SU3   | 0.85           | 0.06           | 4.08      | 0.03           | 1.13           |                       |
| User satisfaction      | I find the EMR system useful in my job                                      | DM_SU4   | 0.9            | 0.06           | 3.93      | 0.03           | 0.9            | 0.64                  |
|                        | I am satisfied with the functions of the EMR system                         | DM_US1   | 1              | .              | 4.04      | 0.03           | 0.67           |                       |
|                        | The EMR system has eased work processes                                     | DM_US2   | 1.09           | 0.05           | 4.09      | 0.03           | 0.52           |                       |
|                        | I am generally satisfied using the EMR system                               | DM_US3   | 1.04           | 0.05           | 4.18      | 0.03           | 0.49           |                       |
| Perceived net benefits | The EMR system will help overcome the limitations of the paper-based system | DM_PNB1  | 1              | .              | 4.05      | 0.03           | 0.67           | 0.53                  |
|                        | Using the EMR system will cause an improvement in patient care delivery     | DM_PNB2  | 1.01           | 0.05           | 4.07      | 0.03           | 0.68           |                       |
|                        | The EMR system facilitates easy access to patient's information             | DM_PNB3  | 1.07           | 0.05           | 3.98      | 0.03           | 0.65           |                       |
|                        | The EMR system will enhance communication among workers                     | DM_PNB4  | 1.02           | 0.05           | 3.9       | 0.03           | 0.73           |                       |
|                        | The EMR system use will cause improved decision making                      | DM_PNB5  | 0.92           | 0.05           | 4.1       | 0.03           | 0.67           |                       |